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CRAFTS for RURAL SCHOOLS

SENIOR BASIC TRAINING COLLEGE

E. J. STOWE

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By

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SENIOR BASIC TRAINING COLLEGE
BANIPUR

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PREFACE

It is impossible in a book of this size to give detailed descriptions of the crafts that are considered worthy of inclusion in the curriculum of Rural Schools. The purpose of this book is to suggest a way in which a school might approach its rural studies through an acquaintance with rural craftsmen. It is thought that the present time is appropriate for such work, in view of the modern tendency to emphasize more fully in the schools a revival of interest in rural life and work.

The suggestions made will require modification to meet local circumstances, as facilities for such study vary in different districts, and much will depend upon co-operation from local craftsmen and farmers. Experience has shown that Rural Science must be made an integral part of the school curriculum. Many points of contact with other subjects will suggest themselves, e.g., with local geography by ecological surveys, with biology, with practical rural engineering, and with arithmetic in which the children are required to collect the data on the farm or in the workshops to solve the problems set by the teacher.

Mr. Lionel Edwards, R.I., kindly drew the illustration which appears on the cover. An explanation of the illustration is given on page 27. The assistance of Mr. E. R. H. Andrews with the illustrations is gratefully acknowledged.

The author's thanks are due to Mr. J. O. Thomas, M.Sc., N.D.A., N.D.D., Mr. Lionel Edwards, R.I., Mr. G. W. Olive, M.A., Mr. J. H. C. Horner, M.A., and to many education officials for criticisms and suggestions and for kindly reading the MSS. Sincere gratitude is also expressed to those craftsmen who have in any way helped by their kind co-operation and advice. Indeed, without their ready aid, this book would never have been written.

E. J. S.

RURAL CRAFTS AND THE SCHOOL

RURAL craftsmen such as farmers, blacksmiths, thatchers, hedgers, foresters, hurdle-makers, and the rest are highly skilled workmen, although they do not always receive the recognition due to them. Too often they are regarded as somewhat inferior. A wider knowledge of their crafts would lead to a greater respect for them and their work. To be skilful enough to make a hurdle or a hay rake, to thatch a rick and make it water-proof, to lay a hedge and make it cattle-proof, to puddle a dew-pond and make it water-tight, are accomplishments of no mean merit. These crafts demand skill, patience and perseverance. A plea is made for a wider co-operation with rural craftsmen by the rural schools. This does not mean that children are to be trained for rural occupations. The value of the training lies simply and solely as a training in craftsmanship and not as a preparation for any definite calling to the countryside. Such training is of equal value to the country boys who will become townsmen and to the country boys who will become land workers. It is not suggested that the country school's craft work should be narrowed into vocational training but that it should be avocational in its broadest sense. The work should be purposeful and closely allied to the school's environment.

The suggestions set out in this book are based on experiences in schools in the South of England. While the principles hold good in most parts of the country, many of the technical terms will not. These vary considerably in different counties. A glossary has been compiled to explain the meanings of the terms used in the text. To omit the craftsmen's terms and expressions would be to deprive the descriptions of much of their value. Their number has been kept as few as possible and each has been carefully explained.

It has been found advisable to start with an attempt at gaining a general sympathy for agriculture among young people, by acquainting them with the main farming operations. Through farm visits the children become interested in the chief farming activities carried on during the four seasons. Spasmodic visits are deprecated. They should be systematic and regular. They should be followed by recording the work done on each visit, and the children's observations should be sought and expected.

The co-operation of the farmer is a great asset. He is a source of first-hand knowledge which makes the work vital to the children. Visits without his friendly aid lose much in their value.

The data which can be collected by the children and the teacher will be incomplete without his help. Moreover, it is essential that the data obtained by the children should be as trustworthy and accurate as possible, hence the importance of securing the farmer's interest and seeking his advice.

If the farmer is willing, let the children (boys and girls of twelve years of age and over) learn to milk by hand, to operate (if possible) his milking machine, to tend the milk cooler, and to do the necessary cleaning tasks after milking. Milking by hand is emphasized because even with the machine it is generally necessary to " strip out " the final milkings. Let the boys and girls gain some idea of the feeding of the cows and their management, particularly during the winter months. Let them, too, help to rear the calves, wean them when six to eight weeks old, teach them to drink out of a bucket, and hand feed them in their winter quarters : in fact, study their life history in general outline.

The same should be done with the rearing of chicks and the management of laying hens, the scholars gaining by direct contact some idea of their welfare and successful control.

In addition, get the farmer to allow the children to inspect his crops at frequent and regular intervals, and encourage the children to record their findings in their notebooks. Foster in the children an intelligent interest in the useful grasses and clovers of the pastures, for though there are over 100 different types, only about a dozen are of any real agricultural value. When the hay crop is hauled to the rick let the children help, by using the hay rakes or the drag rakes which they themselves have made in the school workshop.

In early spring the children should visit local fields, and with the farmer's permission, or, better still, with his active co-operation, assist in laying the field hedges. Hedging is skilled rural craftsmanship. It calls for adept use of the axe in partly splitting each thorn stowl, and bending each in the same direction and at the same time interlacing them to form the body of the thorn hedge. Strong gloves must be worn by each child. The tools can be borrowed : some, e.g., " bitels " (see glossary) can be made by the boys in the school workshop, others may be improvised. Different methods of hedge laying should be demonstrated, because the methods used by hedgers vary widely. The long rods twisted between the upright stakes at the top of a laid hedge are known as " binders." In Buckinghamshire twisted briars are often used as binders. In several of our southern counties long hazel or willow rods are frequently used for this purpose. Some craftsmen lay the thorn stowls of the hedge in one direction only, others in both directions : some use stakes, others utilize the stowls themselves for this purpose and dispense entirely with stakes ; some leave no " dead " wood in the hedge, others leave a bottom layer of " dead " wood, but this is a bad practice. The study of field boundaries can in fact be a fascinating study for the children. It depends mainly on the attitude of the teacher.

In some areas, hedging means little or nothing to the children, for the simple reason that stone walls divide the fields from each other. In such cases the children should try their hands at " stone walling." Skill is needed in " tying-in " the stones, as no binding material, i.e., mortar or cement, is used : the walls are built " dry." Each layer of stones, too, must be placed in their correct position so that the walls grow erect and square. Wall repairs are needed from time to time, and farmers are usually only too pleased to give permission to the school for its scholars to try to repair the damaged sections.

Experience in building or repairing walls can prove extremely interesting and can be a source of practical work in many ways. Exercises in practical arithmetic can be associated with the manual operations, e.g., dimensions, cubic capacity of walls, weight of stone to be quarried to effect repairs or to build a wall, and expenses incurred. Such functional exercises can keep the arithmetical teaching very much alive. It can bring arithmetic out of the rut of the stereotyped and make it one of the most vital subjects of the time-table.

Farm visits, too, can also be utilized to this end. The children can usefully attempt such work as follows :—

Determine the area of one or two fields.

Calculate the cost of laying or trimming the farm hedges.

Ascertain the cost of erecting a stake and barbed wire fence around fields.

Find the weight of hay or straw in the ricks on the farm.

Calculate the capacity of the farm water tanks and wells.

Calculate the cost of thatching ricks or re-thatching farm buildings.

Calculate the yearly cost of shoeing the farm horses.

Value the hurdles made by the hurdle-maker.

Value the thatching spars made by the spar-maker.

Value the timber felled by the woodman.

Cost of hurdles and sheep-cribs used by the shepherd.

Cost of straw leasing on the farm, etc.

Details concerning the training in Practical Rural Arithmetic, which craftwork should provide are set out later in the book, hence it is sufficient to say that the children are expected to collect as much data as possible themselves and to devise their own methods of work in solving the problems set by the teacher. It is important, however, for the teacher to reveal where and when necessary short methods of calculation usually employed by craftsmen, e.g., see suggestions for determining cubic capacity of trees and ricks ; short methods of determining the cost of such farming operations as ploughing, etc.

In addition to all this, the rural schools should make contact with the life of the country craftsmen. For instance, the shepherd will, if persuaded, let the boys take their hay cribs to his fold and use them in the lambing coops ; the hedger will see that they use the "bitels" correctly on the stakes in his newly-laid hedge ; the thatcher will permit the boys to use his spars when he is covering the hay ricks, and the blacksmith will help the boys to make simple repairs to farm implements. To gain their co-operation is not so difficult a task as would at first appear. Provided the teacher approaches them with sympathy and tact successful contacts should ensue. Many country craftsmen have natural powers of intuition far above the average, and in their own particular sphere they are able to pass on information in a most direct and engaging manner. At times, however, it will be necessary for the teacher to translate what the craftsmen have to say, into language readily understandable by the children. Especially will it be necessary to interpret in simple language any technical phrases they use. The teacher should also see that the children are given opportunities of asking the craftsmen questions themselves, so that the fullest use is made of the occasion. Some teachers may feel, however, that they would like to pursue some of the rural crafts for their own sake, and not seek the direct co-operation of craftsmen as suggested above. For such teachers the suggestions set out in pages 17-38 should be helpful.

The boys can do useful work by visits to the village smithy where the smith can act as instructor to small groups of senior boys. The course of instruction should have a rural bias and the things made should be closely related to needs of the countryside. They can make such things as rample-pole fittings, snead irons, whipple trees and weigh-beams ; repair farm machinery and farm tools, e.g., sneads, rakes, hoes, hay cribs, etc.

Details relating to the course of instruction in wrought-iron work evolved by practical experience and experiment are given later, together with a syllabus of work. The course is recommended for senior boys thirteen to fifteen years of age. Its success lies in a close co-operation between the schoolmaster and the smith, the former to supplement the practical work of the latter by oral exposition of the work proposed, and the significance of the work performed.

It is obvious that the work in the smithy is unsuitable for the girls. In Mixed Senior Schools the girls can do domestic science or needlework while the boys do rural handicrafts. This does not mean that the girls can make no direct contact with the crafts. The lesson periods named " Rural Studies " on the time-table can, and should, provide opportunities for joint work by the boys and girls. During these periods the girls should see what work the boys are doing at the smithy, in the school workshop, in the wood, or on the farm. They should learn something of the boys' ironwork, their hedging, thatching, straw leasing, etc., and they should gain some knowledge of milking, chick rearing, etc.

There is, however, one village craft, rural basketry, which appears to be within the province of the girls. Such things as apple baskets, potato baskets, etc., can be made. A knowledge is essential of how and when to cut the willow rods, how to prepare them for use, as well as how to fashion them into the baskets themselves. The course should be a fuller one than that of the more familiar school basketry, because it would deal with *all* the activities of the craft, i.e., from the raw willow rods to the finished baskets.

The drift from the land to the towns has directed attention to the need for more intense presentation of rural ideals in the schools. The decline in the number of workers on the land cannot be fairly ascribed to the Hadow policy of Senior Schools, because many factors have conspired together to bring about this regretted departure from village work. Not the least are the economic and social conditions relative to such livelihoods. Many competent authorities have expressed their belief that better wages and better housing for village workers are factors tending to check the exodus from the land.

Education authorities, particularly rural education authorities, are fully alive to the contribution which rural education may give to this end. They are certainly sympathetic to all movements in the schools which tend to revive and maintain interest in, and love for, village activities.

This, in brief, is what is suggested by rural handicrafts.

The details of the course are set out in pages 17-38 followed by a synopsis of the scheme of work, and suggestions for practical work.

THE SCHOOL WORKSHOP AND ITS EQUIPMENT

It is important that the school should possess a workshop. This need not be an elaborate affair. A shed will do provided it is roomy and weather-proof, where the work can be carried on except during the severest of wintry days, and where the equipment used by rural craftsmen can be set up or stored. The equipment includes vices for clinching wood, vices for splitting wood, moulds for hurdle making and for hay rake teeth shaping. Some simple kind of lathe and a steam chest are also desirable. Details relating to each of these are given in subsequent pages.

(*a*) The Rural Craftsman's Vices for Clinching Wood.

The pattern illustrated in Figure 1 has been found suitable for boys of the age of thirteen and fourteen. The Clinching Vice consists of a wooden standard some 3 ft. 6 in. high and 11 in. wide (3 ft. 3 in. high has been found convenient for the shorter boys). An iron bar is pivoted by means of an iron bolt on the left-hand side support and the iron bar operated by a pedal hinged at ground level and about 2-3 inches distant from the standard. The right foot operates the pedal and indirectly the iron bar above it. The bar clinches the wood leaving the boy free to use both hands in shaping the wood securely held in the vice. Special draw knives are used for this purpose, which may be either straight or curved; or splitting knives, which may be forged by the local blacksmith. These curved knives enable the boys to shape their rake handles, scythe sneads, bitel handles, or the drag rake handles.

In the present instance the vices are firmly secured by angle irons to a part of the main structure (the fixed bench) in the workshop itself. In other instances it has been found wise to cement them in to the floor. It is of the greatest importance that these vices are rigid and firm. The boys' work will suffer if the structures are faulty or weak.

(*b*) The Rural Craftsman's Vices for Splitting Wood.

One or two splitting vices or splitting frames, of a pattern peculiar to the rural craftsman, should be set up either in the school workshop or at a suitable spot near (Fig. 2). These, too, must be very rigid structures to stand the strain of cleaving wood asunder. The splitting tool used is called, in some districts, a " throe." It

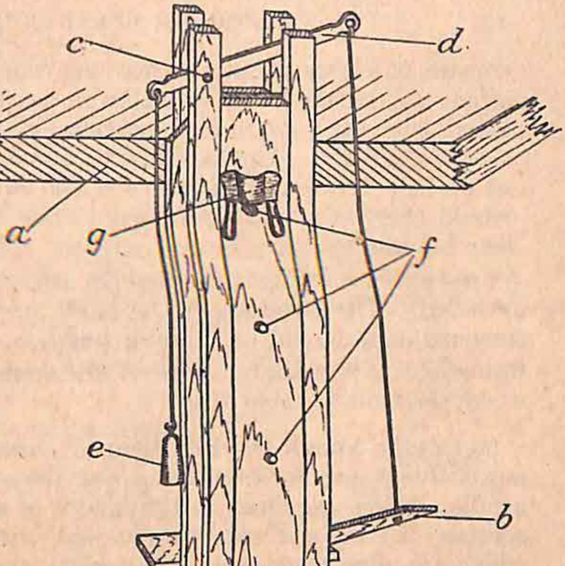


Fig. I. WOOD CLINCHING VICE

a—Bench, to which Vice is securely affixed.

b—Pedal, worked by Operator's Right Foot.

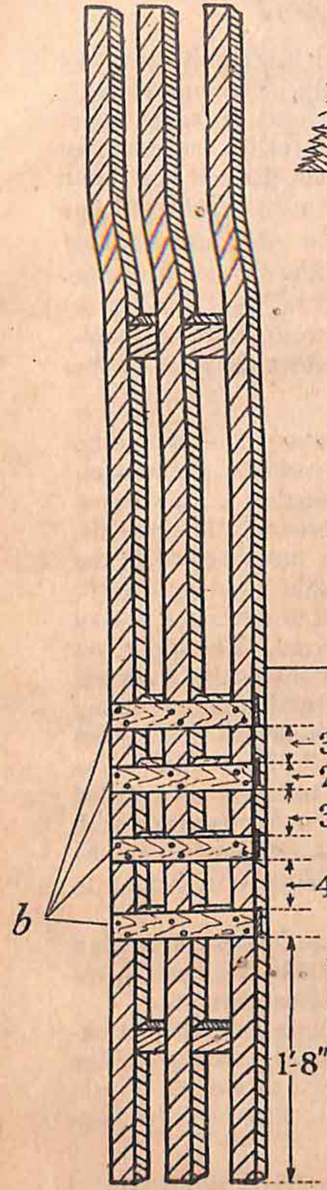
c—" Pivot " Bolt.

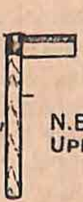
d—Iron Bar (lever).

e—Weight.

f—Wooden Pegs used for hanging Cutting Tools on when not in use.

g—Curved Cutting Tool.





A " THROE "
N.B. CUTTING EDGE ON UPPER SIDE OF BLADE

Fig. 2. WOOD SPLITTING VICE

a—Wooden Uprights (2″ by 2″), firmly cemented into Floor, and if possible, secured to the Ceiling for rigidness.

b—Cross Sections " Jointed " into Uprights.

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consists of a blade about 4 inches long which is securely fitted to a strong ash handle some 10 inches in length. The cutting edge, which is thrust forward as the cleaving proceeds, is on the upper side of the blade. The local blacksmith will readily make one for about half-a-crown. This price is also about the cost the smith would charge for making a curved draw knife. The spar hook may be used too for a similar purpose. The wood most suitable for use in the splitting vice is hazel or ash, withy too should not be excluded. The wood should be fairly "green," i.e., not dry or seasoned, and should be more or less free from knots and malformations of any kind. In short, the straighter the grain in the wood, the more suitable it is.

(*c*) **Scythe Snead Drying Frame.** Another frame should be especially set apart for the shaping of scythe sneads, i.e., the wooden handles which are fitted to the blades of scythes. This frame consists of two or three uprights and crossbars. The sneads, which are often made from withy wood, are first steamed in the steam-chest and then bent to gain that slight twist and curve which all sneads possess. They are then tied to the frame to cool off and retain the form which they have acquired. The slight, yet decided curve at the butt end of the snead should be a natural bend. That cannot be well acquired by steaming and bending. It is necessary, therefore, to select only such shaped butts when arranging for cutting a supply of sneadwood in the coppice. The scythe nibs referred to a little earlier in the text, are also needed and should be affixed to the sneads. These have to be fitted with nib-irons at the smithy. These irons must be clinched in the nibs and the nibs fixed tightly by small wedges at a height to suit the user.

(*d*) **The Workshop Lathe.** The school workshop also needs a lathe. The one illustrated in Fig. 3 was made by the boys themselves and is used to turn scythe "nibs," tool handles, etc.

The tool rest, forged at the smithy, slides forwards and backwards in the slot of the wooden bed made of oak by the boys. The fixed head poppet and the sliding poppet were also made of oak, and the necessary iron fittings in each were fitted by the boys under the guidance of a local blacksmith.

The key to the drawing should help to explain the details of the lathe. The tension of the cord which runs between the driving wheel on the bicycle frame and the pulley wheel on the fixed poppet should be carefully adjusted so that the machine works smoothly. A weight, say ½ cwt., placed on the trestle beneath the

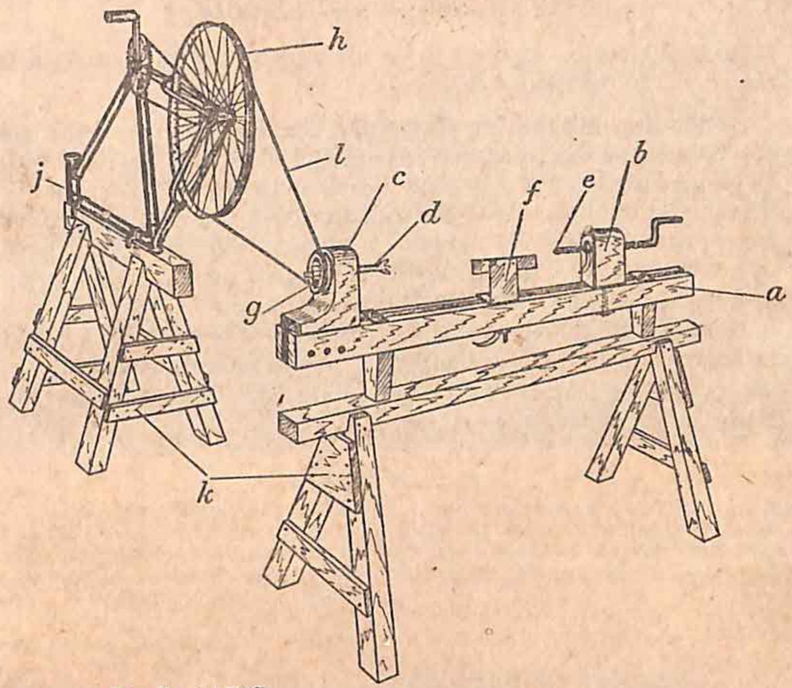


Fig. 3. LATHE

a—Oak bed.
b—Sliding Poppet.
c—Fixed Poppet.
d—Fixed Chuck.
e—Centre Point.
f—Tool Rest.
g—6″ Pulley Wheel.
h—Driving Wheel.
j—Part of Bicycle Frame
k—Trestles.
l—Cord.

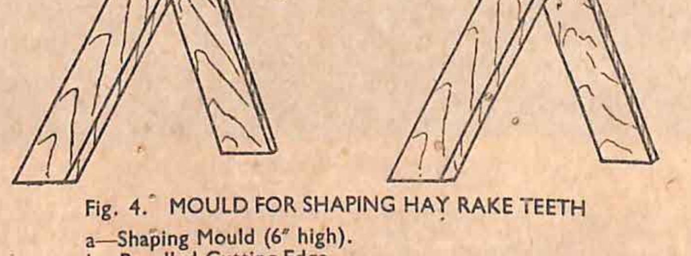


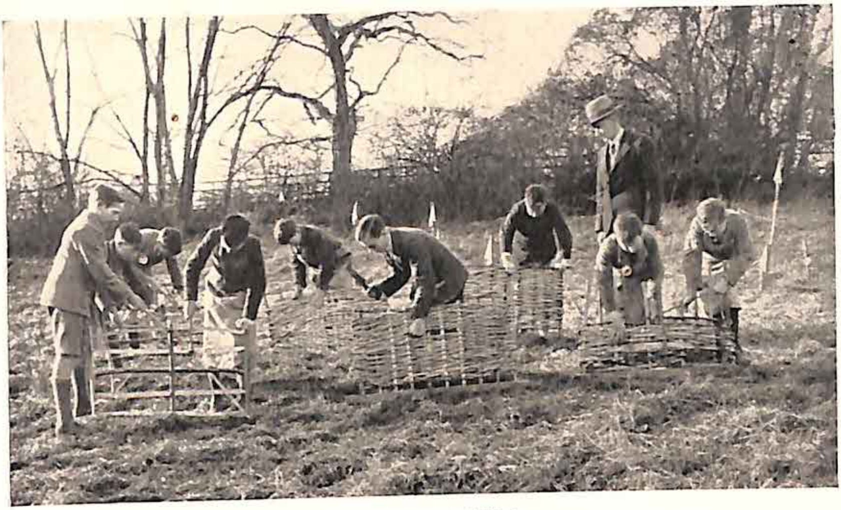
Fig. 4. MOULD FOR SHAPING HAY RAKE TEETH

a—Shaping Mould (6″ high).
b—Bevelled Cutting Edge.
c—Internal Diameter at top $\frac{7}{16}$″, widening gradually to $\frac{1}{2}$″ at Base.
d—Stout Wooden Trestle.

lathe is advisable. If the lathe is allowed to vibrate considerably the work of "turning" suffers.

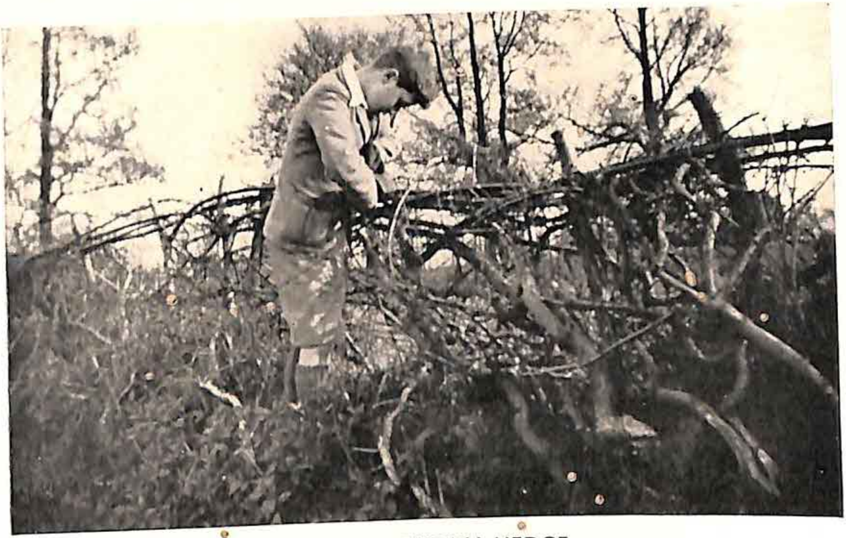
(*e*) **Mould for Shaping Hay-Rake Teeth.** Hay rake teeth are shaped from withy wood in a steel mould some 6 inches long, with an internal diameter of $\frac{7}{16}$ inch at the top and a slightly wider internal diameter at the bottom. This widened lower diameter permits the free passage of the wood through the shaper, which is securely fixed to a stout trestle. (Fig. 4.) Withy is selected for its straight grain and its malleability: "green" wood is unsuitable.

It is sawn off in lengths of about 5 inches. These lengths are split by an axe into suitable sizes and the split portions are driven through the mould—or shaper—by means of a mallet. The teeth are then ready for use in hay-rake making.



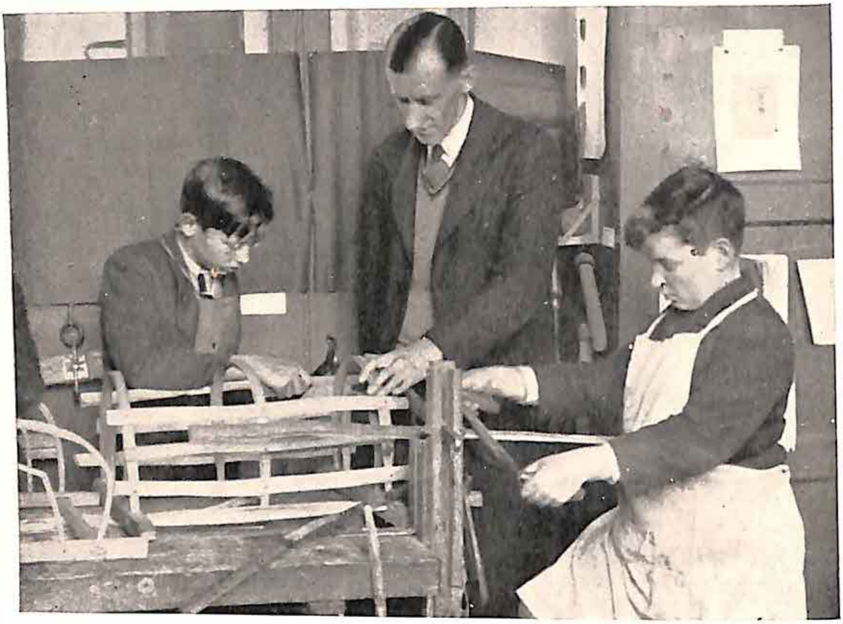
HURDLE MAKING

Two types of hurdles are being made by this class—the wattle hurdle type and the slat hurdle type. The former are being fashioned in hurdle moulds which can be seen fixed in the ground: the latter are made in the boys' workshop and have been brought out for inclusion in the photograph. Both the wattle and the slat hurdles are scale models. The ordinary size is 6 feet by 3 feet.



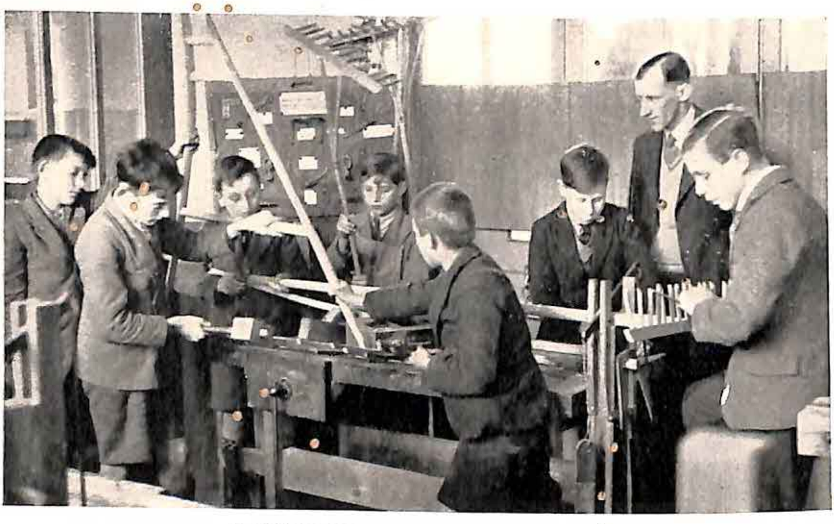
LAYING A THORN HEDGE

A good time to lay a white-thorn hedge is early Spring. Then the sap begins to rise in the thorn stowls, rendering them easier to bend, after they have been partly severed near the ground. Each of the stowls shown in the photograph has been bent to the left and interlaced between the upright wych-elm (or hazel) stakes. The boy is weaving the 'binders'—long hazel rods—between the stakes to form a neat finish. He is wearing strong gloves—these are very necessary for the work.



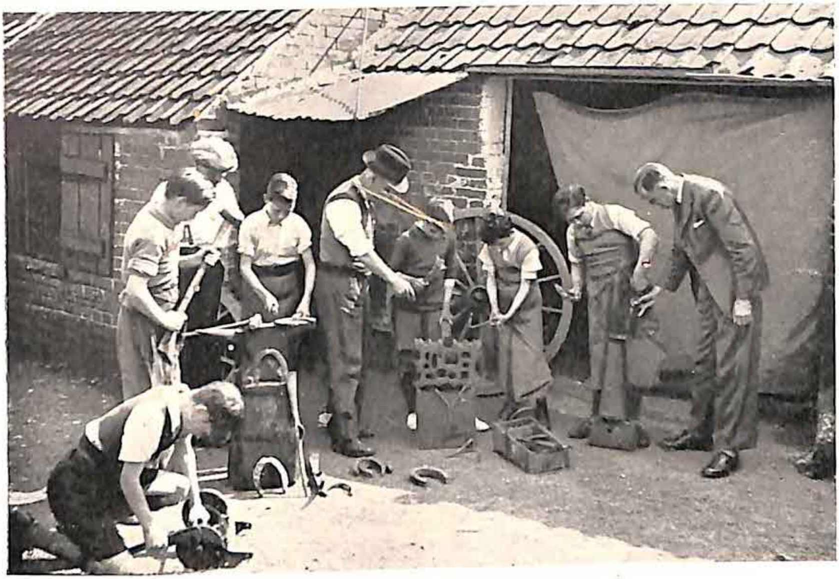
MAKING A SHEEP CRIB

The boys are assembling coop hay-cages (or cribs) which are hay containers for use in the lambing ewes' enclosures called coops. The boy on the right is shaping a slat which is one of six required for each hay-cage. The other boy is nailing a similar slat to a hay-crib which he has practically completed. Note the three large hoops (or bows) and the two small hoops in each cage. These are made of cleft ash.



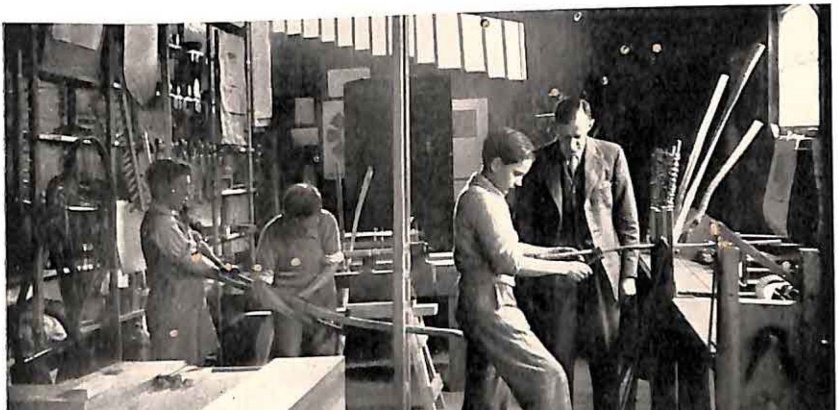
MAKING DRAG- AND HAY-RAKES

Seven boys are busy making hay-rakes (each having 15 teeth) and also a large drag-rake (having 25 teeth). The teeth of the hay-rake are made of withy, those of the drag-rake of ash. Hay-rakes are used on modern farms in spite of the introduction of machinery. The demand for them often exceeds the supply. Drag-rakes are used on the smaller farms. The boy on the right is trimming the completed hay-rake which he has clamped firmly in a special vice used by country folk for this purpose.



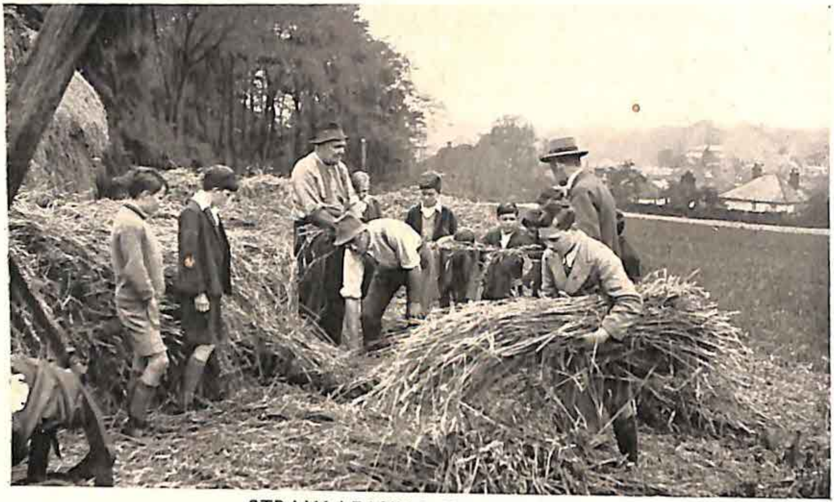
AT THE SMITHY

Half a dozen boys with their Schoolmaster are visiting the Village Smithy, where the two Blacksmiths are teaching the boys at the anvil and swage block something of their craft. Horse shoes are being made, hoes repaired, and bitel rings welded. One boy is setting about a repair job to a mower. For this photograph the boys brought their work out of the Smithy inside which their work is normally done.



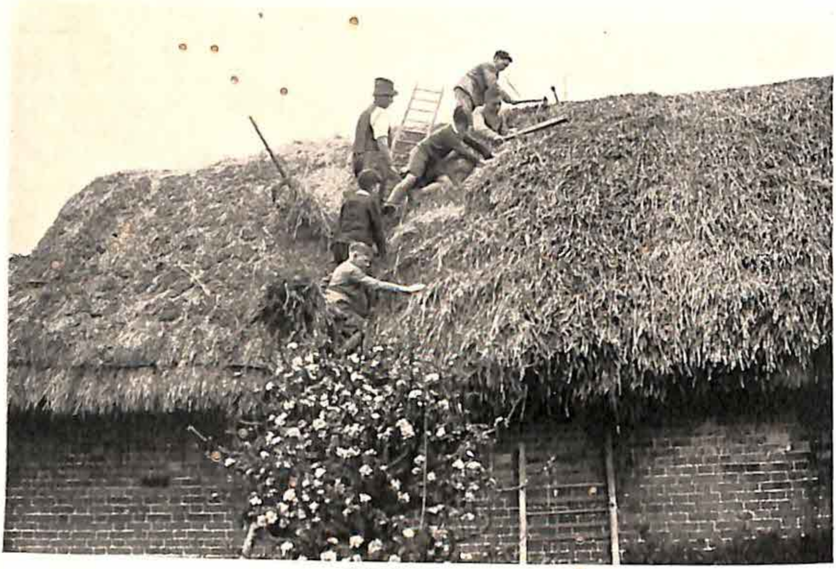
INSIDE A SCHOOL WORKSHOP EQUIPPED FOR RURAL HANDICRAFTS

In this photograph one boy is shaping cleft hazel rods to make a slat hurdle. Some of the long slats which he has already split can be seen lodged against the workshop bench. A hurdle of a different type (a wattle hurdle) can be seen on the bench itself. The two boys on the left are cleaving a withy handle into halves to form a drag-rake handle. The splitting knife, which one of them is using, is called a 'throe.'



STRAW LEASING OR HELMING

The task of arranging rick straw into bundles of thatching straw is known to country folk as 'straw leasing or helming' Each bundle consists of five smaller bundles—known as 'helms.' Each helm of straightened straws is placed 'on the slant' when preparing the bigger bundle, the idea being that each helm can thus be more or less readily separated when the bond which binds the five together is severed. This bond is usually of twisted straw, made by the leaser at the rick. To do this a hook is used. The craftsman twists the hook in making the bond. Bond-making is a two-handed job, i.e., requiring one worker to twist the tool and another worker to guide the straw and keep it as taut as possible. Here the craftsmen are teaching the boys how to do it.



THATCHING

The thatcher is teaching the boys the ancient art of straw thatching. A part of the barn roof has been rethatched and the boys are busy on the remaining portion. Hazel spars are being used to pin the thatch firmly in position. One boy can be seen using a mallet to drive in the spars ; another boy is combing out the new thatch, using a hay-rake head to do so. Others are arranging the helms (bundles) of new thatch in an even layer.

HAY RAKE MAKING

FIFTEEN teeth are allowed for each hay rake head (usually made of ash or lime). The dimensions of the rake head are 24 in. by 1½ in. by ⅞ in. and the length of the hazel or ash handle is 6 ft. 6 in. to 7 ft. sawn down the middle for 20 in. from the head and banded with a piece of tin ⅜ in. wide about 21 in. from the head. The rake head is fixed at an angle of approximately 85° to the handle. The craftsman has his own picturesque way of describing this angle of affixment. He says that the head is " coming in " to the handle and this arrangement is readily understood when the rake is used. It certainly renders its use easier. A good deal of care is needed, therefore, in making the two holes for the handle, each ½ in. in diameter *at the correct angle.* Lath nails are used for fixing.

The handles, if they are to be straight, should be steamed in a steam chest, and straightened in the improvised wooden vice. They should be securely tied to some straight base so that their rigidity is assured. Here they should remain for a few days. It will be obvious that with care and patience this work should not present much difficulty to senior schools, but care is needed in the brace and bit work, so that the 15 holes for the teeth are parallel, and that the handle is affixed at the angle of 85° (approximately). The same degree of care is advised in smoothing off the straightened handle. This may be done first by the curved drawing knife in the rural craftsman's vice, and then by careful sand-papering.

There is a seasonal demand for hay rakes, the early summer being by far the most important. In some areas, iron hay rakes have had to be stocked by the agricultural firms, owing to the fact that the wooden hay rakes are not obtainable in sufficient quantities.

Experience has shown that the boys have a decided preference for making hay rakes, but they should be encouraged to persevere to the more difficult task of making drag rakes. Drag rake heads are usually about 5 ft. 3 in. long, and about 1 in. wide and 2 in. deep. The number of teeth varies. Those made by the boys usually number 25. The teeth are made of ash, each is shouldered 2½ in. from the top, and bevelled ½ in. from the bottom. They are often ½ in. wide, ¾ in. deep, and 9½ in. in length. The handles are often of withy, shaped in the rural vice and sawn down the middle for about ¾ of their length. The length of the handle is about 5 ft. 6 in.

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HURDLE MAKING

The boys shown in the photograph facing page 16 are making half-scale models of wattle hurdles and bar hurdles (sometimes called slat hurdles). For the boys the wattle hurdles, made of split hazel rods, are by far the more difficult to make. Half-scale models are suggested to facilitate the work. To make full-sized models—6 ft. by 3 ft.—would be demanding from the boys more skill and strength than the average boy can be expected to possess.

A " hurdle mould," slightly curved in shape, and pierced with ten holes to take the ten uprights around which the split hazel rods are woven, is needed. This must be securely fixed on the ground by four long stout pegs through the four holes drilled through the mould for the purpose. The two uprights at each end of the hurdle should be stout hazel rods, known to the hurdle maker as " shores," the six other split rods, known as the " sails " are fixed securely in the intervening six holes. The secret of the craft is in the weaving of the body rods, then the heather rods, and finally the finishing rods around these four shores and six sails, leaving a small hole about two-thirds of the way up from the base, known as the quilley hole, for the shepherd's use when he is carrying the hurdles from place to place.

Most of the rods woven between the shores and the sails are of split hazel, hence the art of splitting them is of first importance. This requires skill and patience on the part of the boy hurdle-makers. An easy introduction to this somewhat difficult task can be effected by allowing the boys to split small hazel rods by such homely things as pocket-knives. The rods to be split should not be too " green " i.e., they should be cut some little time before the actual splitting is attempted.

To cleave lengthwise a hazel rod about 3 ft. long needs firm holding in the left hand and careful manipulation of the blade by the right hand. The job looks easy, but appearances are deceptive. One boy, in his written record of this work, said he thought it easy when he watched, but difficult when he tried to do it. His blade, he asserted, persisted in " running out." He was unable, he meant to say, to keep the line of cleavage in the middle of the rod. The two split portions were unequal, thick in some parts and exceedingly thin in others. In short, much of his work was faulty and entirely useless for weaving into the body of the wattle hurdle.

The improvised splitting vices, referred to in the text, should be utilized, and the hazel rods split in them by means of splitting knives—" throes "—or by the spar hook. The vices in question can be made by the boys themselves, using two or three stout poles for the uprights and two or three crossbars securely affixed to these, leaving spaces of two to three inches between them. They should considerably help the boys to develop their powers of splitting the rods.

The only satisfactory way of gaining some insight into the craft is by watching a skilled man at his task and then to copy stroke by stroke, weave by weave, the methods employed. The trimming of the small " ends " by a knobbing hook is also skilled work, demanding accuracy of stroke on the part of the craftsman.

There is a growing demand for wattle hurdles, not only by farmers but also by the suppliers of garden tools. Many people use such hurdles as garden screens. One has only to walk in any city suburb to note how popular wattle hurdles have become.

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SHEEP HAY CAGES (OR HAY CRIBS)

Boys should begin by making the small type of hay cage, usually referred to as Lambing Ewes' hay cages. These are small because they are intended to be used in lambing coops, which are sheltered enclosures made of wattle hurdles padded out with straw. Here the ewes which have just lambed, or are about to lamb, are placed. Only one ewe and her offspring occupy a coop at a time. They stay there for a few days until mother and young are fit to rejoin the flock. Ewes and lambs take a little while to learn to recognize each other, and if they are turned out with the flock too soon they are undoubtedly separated and consequently both suffer. Hence the importance of the lambing coops. The food fed to the ewes during the confinement in the coops includes a plentiful supply of good hay, and this is usually given in the small hay cribs especially made for the purpose. The boys should be taught to make these (see photograph facing page 17). This small hay cage consists of a wooden bed 1 ft. 9 in. long by 1 ft. 6 in. wide, the four sides of which are securely held in position by the two bows, or hoops, one at each end. A certain amount of skill is needed in shaping the bows and bending them to shape after they have been rendered supple by steaming in a workshop steam chest. After the bows have been secured in the bed by lath nails, one central bow is fitted. One smaller bow is needed to be fitted inside each of the larger end bows. The fixing of three cleft wood slats to each side follows and the hay cage is complete. The cage should lie level and should be a rigid and firm structure, capable of good hard wear and exposure to the weather. The full-sized hay cage for use in the large fold is approximately 7 feet long, and on account of its rather lengthy form appears to be somewhat cumbrous to make in school workshops on the usual school benches. It is strongly advocated that the boys gain experience of the work by constructing the small cages.

If the workshop has no steam chest, a local farmer might be persuaded to let the children use his dairy sterilizing chest for the purpose. A temperature of about 200° F. is needed, and the cleft ash needs to remain in the chest some twenty minutes or so to render it as supple as possible, and capable of being bent into the desired hoop shapes. When this shape is secured they should be kept in this form until required.

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BITEL MAKING

Most country boys know what "bitels" are. They are the wooden mallets used on every farm for driving in the wooden stakes when hedging and fencing and for driving the wedges into timber when cleaving it asunder. They are among the most useful tools on any farm.

The bitel (the dictionary often spells it "Beetle") has a handle of ash and a head of apple wood. The head should be about 9 in. long and about 4½ in. in diameter. It must be shaped as round as possible by the boys in the school workshop. Experience has shown that the boys make a better job if they shape the bitel head to fit the bitel ring, rather than vice versa. The drilling of the hole for the ash handle too must be carefully done in the bench vice.

Apple wood is selected for the head because of its toughness and durability, its cross-grained compactness makes it capable of withstanding rough use. The bitel head must be made of well-seasoned wood. It is rendered still more durable by the iron rings, which are made by the smithy to encircle each end. These rings are securely fixed to the head by "spikes" or "dags." The fixing of the rings is a work of skill and the boys should assist in the task under the supervision of a blacksmith. The rings are heated in the forge fire and in their expanded condition are driven firmly home on the bitel and fixed with the "spikes."

Small bitels should be made, not the ordinary-sized ones. Small-sized bitels make the work easier and are within the powers of the boys of 13+.

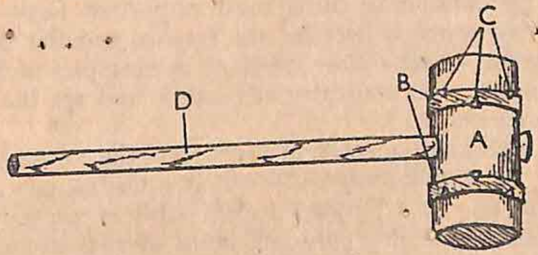

Fig. 5. A BITEL.

A—Head made of apple wood.
B—Iron Rings.
C—"Spikes" or "Dogs."
D—Ash Handle.

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RURAL CARPENTRY

The majority of our larger rural schools teach woodwork. A plea is here made to incorporate into their woodwork schemes some form of what may be termed "Rural Carpentry," i.e., carpentry which has close affinity with the farm. An extension of this nature is long overdue, the more so in view of the rural schools' new contribution towards making its senior scholars "land-conscious." Work of this kind need not be rough and ready. It can be just as accurate and carefully executed as the more usual senior school woodwork. On many occasions it will necessitate the inclusion of other crafts, e.g., ironwork, bricklaying, cement mixing and laying, etc. Those are just the practical exercises which farmers and farm labourers often tackle on the farms to-day, where the former clearly defined vocations of carters, cowmen, dairymen, pigmen, "strappers," etc., are merging into the comprehensive one of "farm-hands."

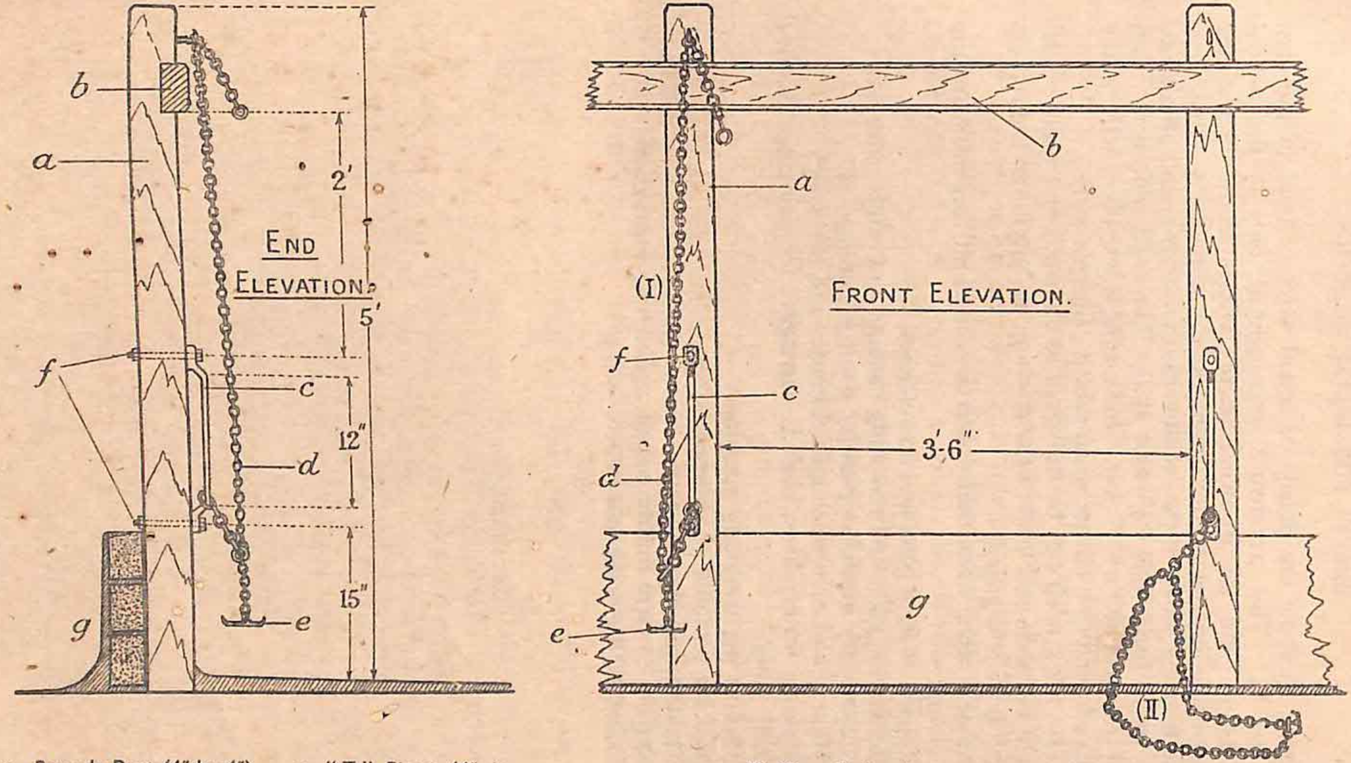
Modern conditions have so reduced the number of men employed on the land that the merging of farm callings on the majority of the smaller farms has become essential. Farm labourers of to-day are decidedly handy-men—good at many kinds of work, not only with animal husbandry and soil management, but with machinery, simple repairs to buildings, alterations and improvements to meet changing conditions and revised standards.

Particularly are our changing times affecting the conditions required in the cow sheds, also known as skillings or shippons. For this reason particular attention has been given to a practical study of reconditioning these most important farm buildings. Practical experience is best for the teacher and the taught, and the suggestions which follow are given as examples of the kind of comprehensive rural carpentry advocated, and are the results of practical experience.

Models (full-sized or scale) of a section of the cow-shed fittings, including the rample posts and irons, cow chains, cow cribs, etc., might be made. If a Young Farmers' Club is run in connection with the School activities (and such clubs are to be recommended), opportunities of actual work in some cow skilling may present themselves, or of assisting in some practical way when new fittings are being introduced at a local farm.

The illustrations of the rample posts and cow stall fittings

Fig. 6. RAMPLE POSTS FOR COW STALLS



a—Rample Post (4" by 4").
b—Head Rail (4" by 2½").
c—Rample Post Iron.
d—Cow Chain.
e—"T" Piece (4" in length).
f—Bolts.
g—Crib.

(I) Cow Chain when not in use. (Hung on hook.)
(II) Cow Chain "looped" (around the Cow's neck).

(Figure 6) show the details of actual work of boys of the ages 13 to 14. The woodwork was carried out at the school workshop, and the ironwork at the village smithy where the blacksmith supervised the forging of the iron fitting illustrated. The housing joints in the woodwork, the forging, and affixing of the irons, demanded care and skill. The handicraft instruction had the genuine rural " twist " in that the work was exactly on the lines adopted by a farmer when refitting his cow-stalls.

The work need not be full-sized as shown, but a scale model might be made and used in the teaching of dairying to the seniors (both boys and girls).

Among other most useful exercises in rural carpentry are the following :—

Repairs to farm gates and farm fences.
Rehanging gates and renewing hanging and catch gate posts.
Making dry mash hoppers for poultry feeding.
Making and-or repairing fowl houses and hen coops.
Making caterpillar-wheeled carriages for moving poultry folding units.
Making pig-weighing machines.
Making portable pig-houses.
Making milking stools.
Repairs to farm buildings and rethatching farm roofs.
Constructing octagonal silos for silage.

HEDGING

Some farmers regard their hedges as an asset; others regard them as a liability. It all depends on their point of view. Stock farmers look upon good hedges as valuable shelters for their beasts, and as strong fences for confining their cattle. Arable farmers, on the other hand, look upon hedges as robbers of fertility and as harbourers of birds which damage their crops. As "wind-breaks" and as boundaries, thick thorn hedges have much to commend them. Against these good qualities must be set their cost of maintenance in good repair. This may be heavy, moderate, or light, according to the condition in which the hedges are kept.

Generally speaking, farm hedges to-day are not so well laid and trimmed as formerly. The truth is that, for the most part, farmers cannot afford to keep their hedges so well as they would wish, for hedge laying and trimming, if done thoroughly in a proper workmanlike manner, are not jobs to be scamped. Partly to sever thick thorn "stowls" in early spring, when the rising sap renders them less brittle and more supple to bend, to fix them firmly between the stakes which are securely driven home with the heavy bitel, and to complete the job by neatly interlacing the binding rods between the stakes, these tasks are the work of a skilled hedger. He is a craftsman none the less important than the village carpenter or saddler. (See photograph facing page 16.)

This is how a good hedger in West Wiltshire would set about his job:

Selecting the long wych elm or hazel stems of the hedgerow he would carefully cut them as close to the ground as possible. Each he would neatly trim, and place in piles to be used later as the binding rods for weaving between the stakes. The long brambles, too, he would cut just as carefully and place in neat piles, to be used, if necessary, for binding in the stowls. He would select the best white-thorn "stowls" for laying; the rest he would neatly trim with his slashing hook, that long hooked blade fitted to a short handle, a tool which every hedger has. To the selected stowls he would give special attention. Each he would partly sever near the ground with a few deft strokes of the axe, and bend in a slanting direction, i.e., "bend uphill."

The whole idea of this bending of the thorn stowls is to encourage "tillering," i.e., to get each stem to send out as many shoots as possible.

WIRE AND SPILE FENCING

In some districts the making of wire and spile fencing, particularly chestnut fencing, has become an established craft. This kind of fencing has become very popular and its popularity is increasing. Wire and spile fencing is too important to be omitted from the school's course of handicrafts for boys of thirteen and fourteen.

This is a description of a method found extremely useful for the work. Two top and bottom wires are first stretched, not very tightly, between two stout straining posts on the site of the proposed fencing. The accompanying sketches (figures 7 and 8) show how the wires should be arranged.

Each pair of wires is twisted, say three times round, in one direction to the *right*. A cleft spile is next threaded through the two pairs of wires, driven a few inches into the ground, and pushed up tight to the twists. The wires are then twisted three times round again—this time to the *left*. The alternate twists prevent the rest of the wire from getting twisted. Each pair of wires is twisted by means of a stout bar through them. Staples are used to fasten the wire to the spiles after the twisting is finished. The spiles should be about 3 inches apart. The cleaving and shaping of the spiles, each about 3 ft. 6 in. long, should be done in the workshop, but the making of the fence is best done out of doors. The making of this fencing is not beyond the powers of a handy strong boy.

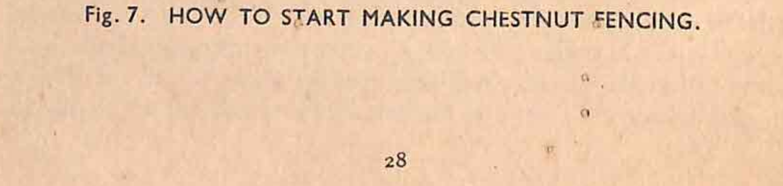
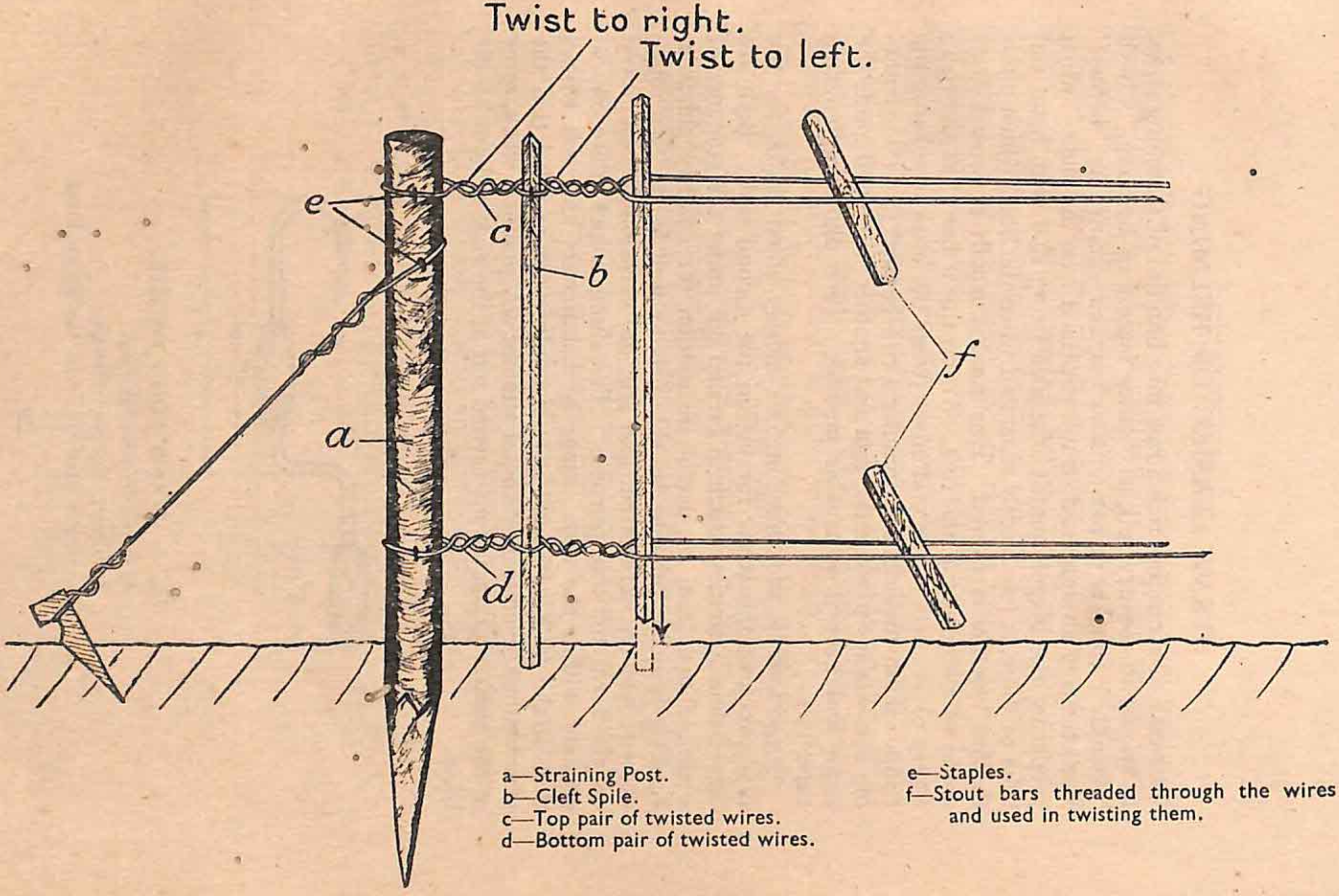


Fig. 7. HOW TO START MAKING CHESTNUT FENCING.

Fig. 8. MAKING CHESTNUT FENCING



a—Straining Post.
b—Cleft Spile.
c—Top pair of twisted wires.
d—Bottom pair of twisted wires.
e—Staples.
f—Stout bars threaded through the wires and used in twisting them.

STRAW LEASING OR HELMING

THE task of arranging rick straw into bundles of thatching straw is known to country folk as " straw leasing or helming." Each " bundle " consists of five smaller bundles—known as " helms." Each helm of straightened straws is placed " on the slant " when preparing the bigger bundle, the idea being that each helm can thus be more or less readily separated when the bond which binds the five together is severed. This bond is usually of twisted straw made by the leaser at the rick. To do this a hook (as shown in figure 9) is used. The craftsman twists the hook in making the bond. Bond-making is frequently a two-handed job, i.e., requiring one worker to twist the tool and another worker to guide the straw and keep it as taut as possible. (See photograph facing page 33.)

Straw leasing and thatching are closely allied crafts, for the first prepares the straw for use in the second task. Both are out-of-door activities which, if carried out under the guidance of a skilled man, can be useful instruction for country children. Leasing is quite suitable for the girls as well as for the boys ; indeed, women were often, and still are occasionally, employed on the farm for this purpose. Thatching comes more appropriately within the boys' range of handicrafts and less within that of the girls, although it is strongly recommended that the girls witness, even if they do not attempt any practical work, some of the thatching operations carried out at the rick or barn by the boys.

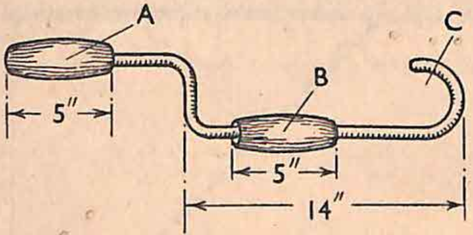


Fig. 9. STRAW BOND TWISTER.
A—Fixed Wooden Handle.
B—Sliding Wooden Handle.
C—Hook used to Twist the Straw Bond.

THATCHING

The thatcher shown in the photograph facing page 33 is teaching the boys the ancient art of straw thatching. A part of the barn roof has been re-thatched and the boys are busy on the remaining portion. They are using wheat straw, which has been leased into helms, and these small bundles are being arranged in an even layer. They are placing the helms so that each slightly overlaps the other. They are careful, too, to tuck each bundle into its neighbour side by side. The butt of each helm is placed alternately in the direction of the eave and the ridge.

Hazel spars, which have been placed in water to render them as supple as possible, are used to pin the new thatch to the firm foundation of the existing thatch. They are twisted and bent as required. A mallet is used to drive them firmly into position. The thatcher and the boys wear some covering for hands (e.g., old gloves), and improvised knee pads are worn as well. These protective measures are strongly recommended. They make the task of thatching less exacting.

As the photograph reveals, the new thatch must be " combed " and straightened after it has been sparred on. One boy is using a rake head for this purpose. Shears are used to trim off odd ends of straw so that the whole business may be as neat as possible. Further, to give the roof a smart finish, a string or two of long hazel rods (or the straight spars) are firmly pinned along the whole length of the roof parallel to, and about a foot from, the eave. A similar string of hazel rods are sparred near the ridge.

Wheat straw is the thatch commonly used, but reeds or good rye straw make excellent thatching—especially for the roofs of buildings. The East Anglian Reed Thatchers are famous for the excellence of their work.

RURAL IRONWORK

THE first few lessons are mainly oral and demonstrational and are given by the smith and the teacher at the smithy. Their object is to introduce the course and to give the boys some idea of the tools and equipment they will use. In these lessons the beginners make the acquaintance of the forge, anvil, swage block, tongs, wrenches, hammers, bench vices of two varieties (i.e., parallel vices and leg vices), drills (the overhead wheel type as well as the commoner breast and hand drills), and various other tools.

The smithy forge is usually the old-fashioned bellows forge. Forges of a more modern type are used in up-to-date metalwork workshops, but the old village forge, honoured by time and tradition, still does its work efficiently. The blast is produced by bellows and enters at the bottom of the fire.

The anvil common to most village smithies, has a pointed beck at one end and a square heel at the other. A small square hole in its face is designed to hold a square-shanked hardie or cutter. Rod iron, of fairly small diameter, and thinner strip iron may be cut upon the hardie.

Many types of forge tongs are used, including the well-known open-mouth and hollow-bit tongs. Several lessons usually elapse before beginners master the rather difficult art of holding them, especially when using them at the anvil.

A copious array of hammers should be available. They should be chosen to suit the strength of the various members of the classes.

The first practical lessons in the smithy are devoted to making the simplest of useful iron requisites, including four types of staples. These four types include staples for use in hard wood staples (two kinds) for use in soft wood, and the clenching staples. They are illustrated by sketches on page 35. " A " is the commonest variety and is intended for use in hard woods such as oak. " B " differs from " A " by having long, thin ends especially drawn for clinching. " C " and " D " have fairly thin ends at different angles and are designed for use in soft woods where it is particularly necessary not to split the grain.

The boys must learn how to tend the forge fire. They must become adept in the use of the slice and the rake in clearing, banking, and drawing over the fire. They must learn that too much or too little fuel on the fire may mean inferior work. Best " smithy breeze " is the fuel used.

The holding of the tongs must be carefully practised. The beginners must also learn to use the hammer with calculated skill and precision and to judge the correct temperature for forging. Under the smith's experienced guidance they will soon perceive how accurately each blow must be timed and placed. The smith is essentially a man of the hammer, and proud of the " hammer marks " on his finished articles, marks of skill and care which should not be filed off. Mild wrought iron, which is generally used by beginners, is a glowing yellow at forging temperature, but mild steel should not be hammered until it is of a bright red colour.

Demonstrations of the forging processes with some more malleable substance than iron are extremely helpful. With strips of thin lead the smith can quickly and clearly illustrate and explain the various operations which his pupils are to repeat in iron. The children are quick to grasp the underlying principles of processes thus illustrated.

The Course of Instruction in Ironwork is primarily intended for boys 12 to 15 years of age. A certain amount of muscular strength as well as mental agility is needed for the practical side of the Course. The work is graded according to difficulty and progressive development, and each lesson follows naturally upon its predecessor. Forging, welding, and riveting are the three branches of ironwork of greatest utility in country districts and therefore the three which occupy the larger part of the syllabus. Every detail of the course is intimately associated with rural life.

The following exercises show how closely the Course is correlated to rural life and work.

Staples. The first articles made by the beginners in ironwork involve two forging processes—*drawing down* and *bending*. A straight rod of approximately 5 in. in length and ¼ in. in diameter is taken, and one end is heated in the forge fire. Having been removed by the tongs at the correct temperature it is placed on the beck of the anvil and then, with a hammer, the end is bevelled off, i.e., drawn down thinner and thinner. The process is repeated with the other end. There is one pitfall to guard against : points must always be drawn down square and rounded afterwards if necessary. Otherwise the outer layers of metal are stretched more than the inner ones and the fault known as " piping " results. Piping (see Glossary) causes *hollow* points to be forged at the anvil. When both points are complete and perfect, the middle section of the rod is heated and bent over the beck.

S-Links and Shut-Links. The forging of these requires an increase in skill on the part of the boy-smith. ¼ in. rod iron is again used and both are forged at the back of the anvil (see page 35).

These links are invaluable to the farmer and his men, the shut-link being exceptionally useful for emergency repairs. Should a tug or trace break, the carter can usually produce a shut-link from his voluminous pockets and mend the break in a few moments.

When the boys have become fairly proficient in working rod-iron, they proceed to the forging of strip iron. Strips about ½ in. wide and 3/16 or ⅛ in. in thickness (preferably the latter, because it is easier to forge on the anvil and bend in the vice) are used. With these the scholars attempt to make angle plates, or " angle-irons," corner brackets, etc.

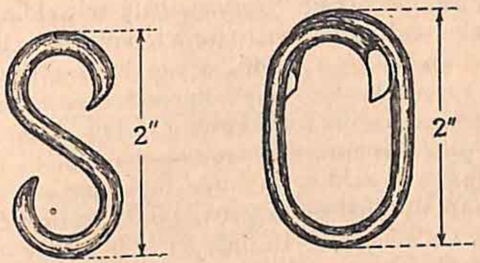
Incidentally this work introduces them to the overhead wheel drill, for the angle plates require two or three screw holes in each angled side. These holes must also be countersunk. Great care is always taken to enclose the cogs and bearings of the large drill in sheet iron before the scholars are allowed to use it—as set out in the Factory Act, to ensure the safety of workers. By so doing, any possibility of rather nasty accidents is prevented. When drilling, the boys work in pairs, one operating the wheel and the other drilling.

So far all the exercises have been in forging, for this occupies a large proportion of the smith's time. The smith's work lies in shaping iron to his will, at the forge, on the anvil and in the vice, and creating things both useful and beautiful. He is an artist as well as a craftsman, and perhaps in the former capacity lies the hope of village smithies for the future. There is a growing demand for artistic rural ironwork, especially for such articles as gates of ornamental design.

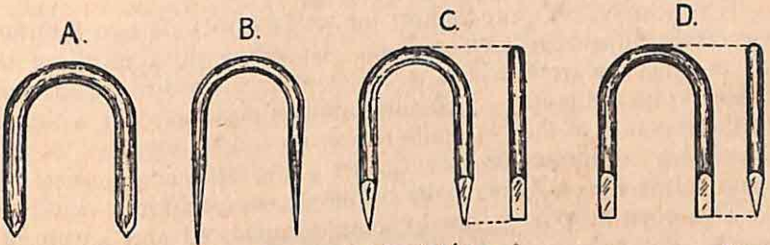
Having mastered the main forging processes the boys now arrive at the next stage, viz :—

Welding. Welding implies the perfect union of different pieces of iron into one coherent whole. The pieces of iron to be welded have to be subjected to a terrific heat until they become white-hot and pasty. At the exact moment the pieces are taken from the forge fire as quickly as possible and hammered together. It is not easy to judge when the exact moment arrives, and intuition only comes with experience. Hence the smith's example is invaluable.

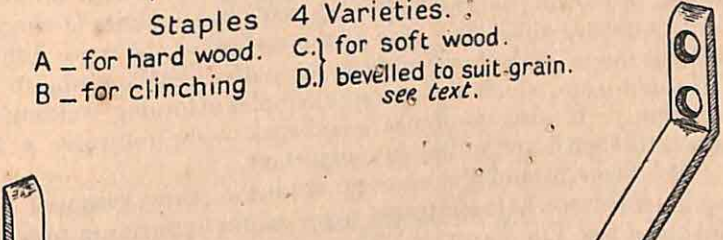
At this stage the boys make the acquaintance of Fluxes. Iron is



S_Link Shut-Link.



Staples 4 Varieties.
A _ for hard wood. C.} for soft wood.
B _ for clinching D.} bevelled to suit grain.
see text.



Angle Plates.
a _ countersunk screw holes.

Fig. 10.

inclined to oxidise, or "scale" very quickly at welding temperature, and if such a scale is allowed to form it will effectually prevent a perfect weld. Therefore, a handful of the flux is thrown into the fire as the iron approaches welding temperature, and this dissolves the oxide and prevents more from forming. Sand is the flux often used, but borax and sal-ammoniac are also common.

The making of a T-weld is the boys' first exercise in welding. Later the scholars proceed to unite two pieces of iron end to end to form a right-angled plate. In this, screw holes are drilled and countersunk ready for use. Other simple processes in welding are the faggot-weld and the lap-weld, a good example of the latter being the making of a link or ring.

Incidentally, the preparations for welding include two forging processes—upsetting and scarfing. Upsetting thickens the end of the piece of iron which is to be welded by direct hammer blows upon the point. Such thickening is necessary, for without it the junction of the two units which are welded together would inevitably be thinner than their other parts. Scarfing consists of hammering the ends diagonally so that an easy weld may result.

The boys now begin to do more complicated and advanced work. Following naturally after lap welds and links are D-shackles and double D-shackles. One of the earliest of the more difficult models made by the boy-smiths is the half-scale Weigh-beam and Whipple-trees, which incorporate examples of forging, welding and riveting. It also combines woodwork with ironwork, a step which is significant and highly important.

The diagram and the close-up studies of these essential parts of horses' trace harness reveal many of the interesting processes involved (see Fig. No. 11). The double D-shackles plate riveted on to the weigh-beam may be noticed, and also the ring (example of welding) attached to the upper part of the double D. An elliptical link, stapled on to the whipple-tree, a ring and a D-shackle attach each whipple-tree to the end cap of the weigh-beam. It is interesting too, to note how the D-shackles and double D-shackles are pierced for the insertion of a bolt and pin. The holes to take the pins are punched out first by key punches and then by follow-on punches. This ensures that all possible metal is conserved at the points where the key fits, and that the parts remain as strong as can be. The weigh-beam is 28 in. long, and the whipple-trees are each 24 in. The beam and the whipple-trees are of stout ash.

Strap bolts afford the boys good training in the cutting of an external thread for any given nut. The cutting of an external

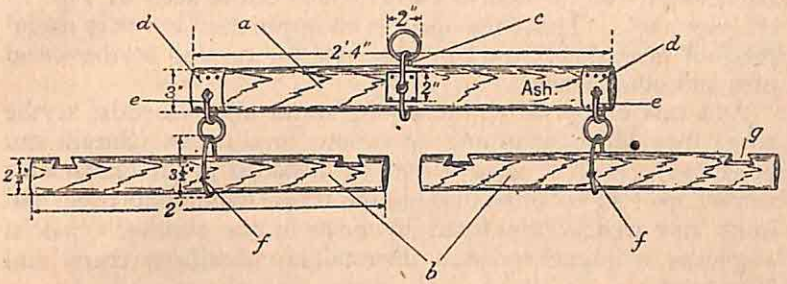


Fig. 11. WEIGH-BEAM AND WHIPPLE-TREES (½ Scale Model).

a—Weigh-beam.

b—Whipple-trees.

c—Double "D" Shackle.

d—End caps riveted to Weigh-beam.

e—"D" Shackles.

f—Staples.

g—Notch for horse's traces.

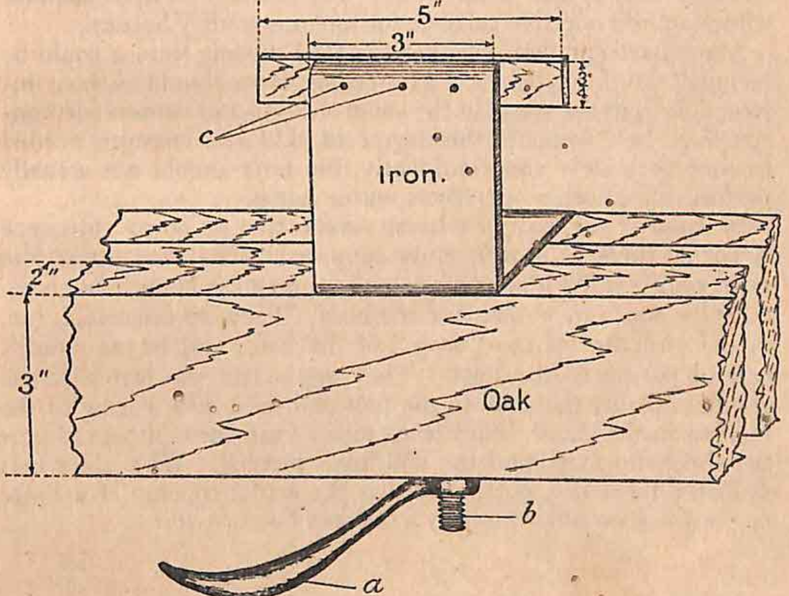


Fig. 12. TOOL-REST FOR SCHOOL LATHE.

a—Rat-tailed Nut. b—End of bolt. c—Rivets.

thread is still more advanced work, an example of which is the rat-tailed nut on the School Lathe (which can be seen in Fig. 12 on page 37). The lathe itself is an improvised but very useful piece of mechanism, used by the boys for turning scythe snead nibs and other articles.

And this brings us to the scythe snead nibs, essential scythe accessories which again link up various rural crafts. Sneads can be shaped wherever steam chests are installed in the craftsmen's workshops : nibs can be made in the school handicrafts room and irons and wedges are fitted by boys in the smithy. Special emphasis is placed upon a dove-tailing of village crafts and industries.

This eminently practical work is calculated to be of considerable value to the future worker on the modern farm with its tractors, combines and other complicated machinery. Lessons in thread-cutting and the fitting of nuts are considered to be especially important. The boys, too, are proud of their work in this line and especially of their strap-axles. Such axles hold the caterpillar wheels on the portable carriage for moving poultry houses.

Many have enquired whether practical shoeing lessons could be included in the syllabus. The senior boys should receive instruction from the smith in the art of shoeing and witness demonstrations, but owing to the degree of skill and strength needed to shoe accurately and confidently, the boys should not actually perform the shoeing operations on the horse.

A study of the hoof of a horse reveals that its horny substance is not so thick as is frequently supposed. The boys appreciate from such a study how accurately the shoe must fit and how carefully the smith must nail it to the hoof. They are interested, too, in the structure of the " frog " of the hoof, and in the smith's careful paring of the hoof. They appreciate the fact that the good smith fits the shoe to the foot and does little paring of the hoof to fit the shoe. They learn much from the smith as to how the shoes are made and the nail holes pierced. With older lads available there is a possibility that the actual shoeing of a horse or pony can be carried out by a selected boy or two.

SUGGESTIONS FOR PRACTICAL INVESTIGATIONS DURING THE VISITS TO FARM AND WORKSHOP

AT THE SHEEP FOLD.

What types of hurdles are used ?
How many of each type are there ?
Find out where the lambing fold is (or was) this year.
What are lambing ewes' coops ?
Why are they necessary ?
Find out what kind of hay cages are used.
Measure their lengths.
How many " bows " or " hoops " to each cage ?
Why are they necessary ?

AT A HAY RICK.

Note how the rick is thatched.
Did the thatcher start at the top or bottom of the roof ?
Why are hazel rods " sparred on " round the lower edge ?
Calculate weight of hay in the rick (allow 2 cwts. to each cubic yard of hay—this is an approximate estimation only, and is not absolutely correct, but it serves as a rough and ready guide to quick calculations of the weight of hay ricks).

IN THE HAY FIELD.

What machines are being used ?
How many waggons ? Hay sweeps ?
Is there an elevator ? A mechanical loader ?
Are wooden hay rakes used ?
Are any wooden drag rakes used ?
If so, how many of each ?

IN THE HARVEST FIELD.

What crop is being hauled ?
What shape rick is being built—oblong or circular ?
Find out when the crop was cut.
Calculate how long the sheaves have been standing in aisle. Why does the length of time vary for different crops ?

ON THE FARM.

Could you harness a pony to a trap.
Or the horses to a plough ?
If not, go and see a carter do so and then try to copy his methods.
Find out what a bridle is, a halter, a snaffle.
What are traces, hames, tugs ?
What are whipple trees ? (These are sometimes called " wippenses," " swingle bars," " billets," or " swingle-trees.")

AT THE BLACKSMITH'S SHOP.

Watch a horse being shod.
How many nail holes in a horse's shoe ? Are there always the same number ?
What is the width of the shoe ? The widths vary, why ?
How often are horses shod ? The periods vary considerably, why ?
Where is the " frog " in the horse's hoof ?
Has the horse a " chestnut " or " cawkin " on his legs ?
What is the blacksmith's anvil, forge, swage block ?
Note the forge bellows and the forge fire.
What special kind of coal is used ?

WITH THE HEDGER.

Note his tools.
What are " stowls " ?
Why are they partly cut across and then bent in a slanting direction?
What are " binders " ? Of what wood are they ? Are stakes used ?
When are the best times to lay a hedge ?
Try to discover different ways of hedging in use in your district, and record your findings in your note-books.

WITH THE HURDLE MAKER IN THE COPPICE.

Visit the hurdle maker and watch him at work.
Note his tools.
Where is the hurdle " mould " ? What is its shape ?
How is it fixed to the ground ?
What wood is being used to make the hurdles ?
Enquire when it was cut, and ask its approximate age.
How far is the quilley hole from the top ?
Count the " shores " and the " sails." How many of each ?
Note how the rods are woven at the start and at the finish. Measure a finished hurdle. Hurdles vary in dimensions, why ?

WORK IN A COPSE.

(*a*) Visit a copse where the woodmen are felling trees.
Note their methods and tools they use.
Count the " rings " across the butt of a felled tree and from the count estimate its age.
Measure the girth half-way between the top and the bottom.
Regard it as the average girth for the whole length and use it to ascertain the tree's cubic feet of timber.
(*b*) Visit the spinney where the underwood is being cut. Get the woodman to show you how to twist a hazel bond for a faggot, or a bavin. Enquire what faggots and bavins are.

Find out if any of the following crafts are carried out in your neighbourhood :—

1. Besom making.
2. Dovecote manufacture—roofs thatched with heather or straw.

These crafts are still carried on in certain areas. If any are followed in your district try to find out how many craftsmen are still engaged at them and whether their number is increasing or decreasing.

The craft named first in the list (that of Besom making) is very successfully followed in North Hants, and the second in South Wilts. The latter appears to be a growing industry. It calls for a high standard of thatching in heather as well as a skilled fixing of the barrel on the dove-cote pole. The senior boys make such dove-cotes, the exercise calling forth a good deal of co-operative effort among them.

From what kind of tree are the sprays cut to make a besom?

What is used to bind them together?

How is the handle fixed?

3. Elm bowl turning.

4. Chair-leg "bodgering." A few craftsmen still turn the Windsor chair legs in the beech woods of Buckingham. They use the rural craftsmen type of lathe.

5. Sieve Frame Making.

6. Chestnut Fencing. In some districts the making of chestnut fencing has become an important craft. Why? How are the chestnut spiles fashioned by the craftsman? What tools does he use for the purpose? How are the wire strands twisted around the spiles? Find out the price of the fencing (*a*) per yard, (*b*) per roll of 50 yards.

SYNOPSIS OF SCHEME OF WORK

Instruction to be given in the following Rural Handicrafts.

1. The Making of Hay Rakes (Each 15 teeth).
    1. The shaping of hay rake teeth by means of the steel mould. Wood to be used—withy (see Fig. 4).
    2. Making the rake head—post-vice work. Wood to be used—ash, lime or beech.
    3. Fixing the teeth in the rake head—" trimming off."
    4. Shaping and fitting handle.
2. The Making of Drag Rakes (each 25 teeth).
    1. Teeth of ash to be " shouldered " and bevelled.
    2. Rake head of ash to be shaped and prepared for teeth.
    3. Handle to be of withy and affixed to rake head by pinning.
3. Shaping Tool Handles.
    1. For hoes, " bitels," etc.
    2. Bending and shaping scythe sneads (if opportunity occurs). Wood to be used—withy.
4. Fitting up an improvised Lathe and turning " nibs " for scythe sneads, handles for reap-hooks, etc.
5. Sheep Crib (or Hay Cage) Making.
    1. The type of crib to be made is known as " Lambing ewes " hay cage," and is to be of small dimensions, i.e., 1 ft. 9 in. by 1 ft. 6 in. Crib bed to be made of ash, lime or hazel.
       Crib bows (3 large, 2 small) to be of ash or hazel, preferably ash. Bows to be steamed to render wood supple and bent to shape in vice.
    2. Use the " throe " (splitting knife) and draw knife.
    3. Shaping and fitting bows in sheep crib bed (secure bows by means of lath nails).
    4. " Finishing off " sides by three cleft pieces of wood 1 in. wide and $\frac{3}{8}$ in. thick, length 2 feet each.
6. Bar or Gate Fencing. (Hazel or ash to be used).
   Half-scale models to be made, i.e., 3 ft. long and 1 ft. 8 in. high. Cleft wood only to be used. Cleave the wood asunder by the splitting knife in the splitting vice described in the text.
7. Wattle Hurdle Making.
   Four " shores " in the mould.
   Six " sails " in the mould.
   Body rods, heather rods, finishing rods, quilley hole.
   Use (*a*) Splitting knife or spar hook, (*b*) finish off with knobbing hook.

8. STRAW LEASING OR HELMING.

9. THATCHING.

10. HEDGE LAYING AND TRIMMING.

11. DRY STONE WALL BUILDING.

12. MAKING OF " BITELS " (BEETLES).
    1. Shaping head of apple wood.
    2. Shaping handle of ash.
    3. Forging bitel rings and affixing them with " dags " at the smithy.

13. COURSE OF INSTRUCTION IN RURAL IRONWORK.

    Forging processes to include shaping on anvil, upsetting, drawing down, etc.

    1. Staples—four types.
    2. S-links and shut-links.
    3. Angle-plates.
    4. Holdfasts and latches.
    5. Handles.
    6. Welding processes :—
        - (*a*) T-weld.
        - (*b*) Links.
        - (*c*) Corner plates.

    Forging and-or Welding combined with further processes, including thread cutting and riveting :

    7. (*a*) Strap-bolts—examples of cutting external threads and fitting with nuts and washers.
        (*b*) Strap-axles—involving fitting a stationary washer and drilling axle for pin.
    8. Door-fittings—including plate, thumb-press, latches, catches, guides, hinges, etc.
    9. Callipers—involving riveting and forging processes of a more advanced character.
    10. Spanners—hack-saws used to cut nut-grips.
    11. Weigh-beam and Whipple-trees ($\frac{1}{2}$-scale model)—forging, welding of rings and double D-shackles, and riveting iron plates to woodwork.
    12. Beetle (or Bitel), with irons—welding of bitel rings and fitting with spikes.
    13. Tool-rest for Lathe (with rat-tail nut)—includes example of cutting an internal thread.
    14. Rample " Irons " for Cow stalls—involves forging in stouter rod iron, which calls for greater skill and strength.
    15. Portable Carriage for moving fowl houses. Fitted with caterpillar wheels, strap axles, hinges, etc. Also "Pads" for wheels fitted with Pad Irons.
    16. Half-scale models of Harrow Poles (oak)—including fittings to take three Harrows.

17. " Snead Irons "—including clinching nib irons and wedges, scythe blade wedges and rings and support.
18. Repairs to farm implements.

14. INSTRUCTION IN RURAL CARPENTRY.
    1. Repairs to farm gates.
    2. Making dry-mash hoppers for poultry feeding.
    3. Making poultry folding units and moving carriages for them.
    4. Making pig-weighing machines.
    5. Repairs to farm buildings e.g., rethatching farm roofs.
    6. Model Rample Posts and Fittings for Cow Stalls.
    7. Making milking stools.
    8. Constructing silos for silage, etc.

15. FORESTRY—WORK IN THE WOODS.

16. RURAL BASKET MAKING.

RURAL CRAFTS AND ARITHMETIC.

Suggestions for Practical Work

The children go to the farms, fields, and workshops with purposeful intention. Some have tape measures, others graduated measuring rods or carpenters' rules. All have note-books. The data entered are the results of the children's own investigations, and form the basis of the arithmetical exercises. These exercises centre round each visit.

The text-book, although still essential for routine work in Arithmetic, is dethroned from its position of prior importance and its place taken by the scholar's own note-book, in which are recorded data obtained first-hand. Practical Arithmetic is essentially the children's sphere of activity. The teacher's rôle is that of a guide. Stress is placed on learning rather than on teaching. The children need guidance and co-operation from the teacher—that must ever be so—but the point to be emphasized is that all the work must be the children's own. The problems they attempt to solve must be objective—they must have "point" a quality the text-book exercises seldom have in the children's eyes.

Teachers know only too well that many of their pupils readily tackle the "problems" of the usual arithmetic text-book, but are completely at a loss when asked to compute a simple calculation from their own data. The truth is that many text-books do too much for the children. When the *whole* problem is theirs—then, and only then, do they realize they must devise their own methods of work. In throwing the children on their own resources arithmetic is made real and vital. With practice they acquire a new orientation of outlook. They come to see that practical work means added responsibility resulting from their being thrown on their own resources.

The scholars' exercises set out on the following pages should be regarded as prototypes—as suggestions for the teacher's consideration. Many teachers will wish to draw up their own series of practical problems for their scholars to solve. The scholars, too, will have suggestions to make once their enthusiasm is fired and their appreciation aroused.

The exercises are not "advanced" in character. In framing them, the claims of the B and C streams of senior scholars have not been overlooked. To some teachers, they may appear too easy.

The crux of the work is accuracy, and this is just the trait which is not always sufficiently stressed in our schools to-day. Further, it will be readily agreed that work in the vital subject of Arithmetic must not degenerate into a series of mere mechanical operations. It must stride forward in line with the new ideals in our rural schools. It must be more energizing and stimulating than in the past, and the pupils must be trained to see that accuracy and purposefulness must go hand in hand.

In the exercises on the following pages, the children are expected to fill in the blank spaces with the data which they themselves have collected. The approximate figures are given for the guidance of teachers in the Appendix on page 65.

HEDGING AND DITCHING

THE children should visit a nearby field and obtain the data to solve the following exercises themselves. They should work in groups under group leaders. Marks should be awarded for accuracy and carefulness, both in the actual measuring operations and in the written records setting out the calculations. The spirit of emulation between group and group should be a valuable stimulation to good results.

1. Measure the length of the hedges and calculate :

(*a*) Cost of " laying " them at   a perch.

(*b*) Cost of " trimming " them at   a perch.

2. Measure the length of the ditches in the field and determine the cost of cleaning and digging them out at   a chain.

3. Calculate the cost of erecting a two strand barbed-wire fence around the field.

Acreage.—Field visits provide opportunities of conveying to the children the meaning of this term. Too often it is found that acres, roods, square perches, etc., remain mere nomenclature of spaces without any definite and real appreciation of their value. The children should obtain a more exact knowledge of square measures by practical experience.

1. Measure off in the field, and mark by pegs, a " lug " of land (a " lug " is the same as a square pole, or square perch).

2. Mark off by pegs a rood.

3. Mark off 4 roods (an acre).

4. Estimate the area—in acres—of the field in which you are working. Enquire of the farmer if your estimate is approximately correct.

5. Survey the field, using a theodolite (see page 53) and calculate its exact acreage. N.B. In all instances measure in links. Find a short method of reducing square links to acres.

6. (*a*) Try to estimate at sight the acreage of different fields.

(*b*) Check your answers by ascertaining the exact acreage from an ordnance survey map of the parish.

STONE WALL BUILDING

THE children should visit a field enclosed by walls and furnish themselves with data to answer the questions set out below. They should work in groups under group leaders, and the same method as detailed on the previous page should be followed.

1. Measure the length, height and width of the walls on each side of the field.

2. Calculate how much land is covered by each wall.

3. Calculate the cubic capacity of each wall.

4. Try to find the weight of a cubic yard of the stone used in building the walls.

5. From this, calculate the weight of stone needed to build the walls of the field.

6. Find how many fields on the farm you visit are enclosed by walls. Visit the fields and roughly estimate the quantity of stone needed to build all the walls on the farm.

7. In stone wall country, arable land is often enclosed by walls. Visit some arable land. Watch a tractor and also a pair of horses ploughing. Measure width and depth of the furrows in each case, and enquire how many acres each would plough in an eight-hour day.

(The rate of work is affected by the stiffness (or otherwise) of the soil. The width of the furrow is another important factor.)

8. If the rate of ploughing by tractor was   acres a day how long would it take to plough the arable land you visit ?

How long would it take to plough a sixteen acre field ?

(*a*) Using a two-horse plough ?

(*b*) Using a tractor plough ?

There is a very easy way of finding rates of work for such farming operations as ploughing, drilling, etc. As 1 acre is 6,272,640 sq. ins. and 1 mile is 63,360 inches, it follows (by dividing the first figure by the second) that 99 miles must be travelled to plough or drill an acre if the furrow or drill is one inch wide. If 9 in. wide, the distance to be travelled would be nine times less, i.e., $\frac{99}{9}$ or 11 miles to cover one acre and so on. Teachers can set many fascinating problems on this simple formula.

Work in the Woods

1. Pay a visit to a nearby wood. Find a large tree and name it. Measure its girth about 6 feet from the ground.

Calculate the height of the tree as described on pages 53 and 56.

A table of tangents is given on page 67 and should be used for this purpose.

Then determine its capacity in cubic feet.

2. Find the weight of the tree you have just measured. The weight of one cubic foot might be obtained from your nearest timber merchant.

3. Calculate the value of the tree at   a cubic foot. (From your nearest timber merchant this data can be obtained.)

4. Measure the floor of your class-room and estimate the amount of floor-boarding needed to cover it.

5. Calculate the number of trees of the above dimensions which it would be necessary to fell to provide the floor-boarding needed for your classroom.

N.B.—In the timber trade, it is commonly held that 35 per cent. to 40 per cent. of the gross cubic capacity of a tree is wasted in converting English timber into sawn timber. A deduction of 40 per cent. should be made when determining the nett amount of sawn timber a tree would yield.

6. What would be the cost of this amount of floor-boarding at   a foot? (Enquire this figure of a local carpenter or builder.)

PRACTICAL WORK AT THE FARM RICKS

THE children should study the method suggested below, then go to a local farm where they should measure one or two ricks (hay and straw ricks if possible). They should determine, unaided, the weight of the ricks. Class discussions should follow dealing with short methods of work which might have been adopted by the children when ascertaining or recording the necessary dimensions at the ricks.

Method suggested :—

1. Measure the length and breadth of the rick half-way up to the eaves.
2. Measure the two lengths and take the average length.
3. Measure the two breadths and take the average breadth.
4. Take the height from ground to eaves *perpendicularly*.
5. Take the length and breadth at the eaves for the top.
6. Take ⅓ of the perpendicular height from the eaves to the ridge.
7. Calculate the cubical contents of the rick.
8. Find out the weight of a cubic yard of the hay (or straw) and so determine weight of the rick.

N.B.—If the roof of the rick has *sloping* ends, ¼ of the perpendicular height from eave to ridge is taken.

A rick (30 ft. long and 15 ft. wide), needs roughly   bundles of straw to thatch it. At this rate how many bundles of thatching straw would be needed to thatch the ricks you have measured ?

A bundle of thatching straw costs about . . . .

Find how much it would cost the farmer for thatching straw for each rick you have measured.

STRAW LEASING

LEASING is either done by the usual farm hands during the ordinary working hours or by country craftsmen as "task work," or "piece work." Occasionally leasing is done by women. If it is done as "task work" the workers are paid a lump sum for the whole task of leasing the straw rick or ricks. If it is done as "piece work" they are paid so much for every 100 bundles they lease.

The scholars should find out the local rates of payment for this work. These they should record in their notebooks and use them in such exercises as suggested below.

Exercises for the Scholars.

1. Find out the number of bundles of leased straw which would be—or were—needed to thatch the ricks on the farm you regularly visit.

2. Calculate the cost, at the local cost of payment, of leasing this number of bundles,
   - (*a*) if done as piece-work by men;
   - (*b*) if done as piece-work by women.

3. Visit a rick where the leasing is in progress. Count the number of bundles already leased.
   - (*a*) Calculate cost of leasing this number at the rate of payment current in your district.
   - (*b*) Calculate their value at the current price.

4. Estimate roughly the number of bundles of thatching straw which will be made from the remaining portion of the ricks. Determine their value and their cost of leasing.

Spar Making. Visit the copse and watch a spar-maker at work. Then try to split the hazel rods as he does, point each end of the spars, and arrange them in bundles of 250.

Long thatching spars are about per 1,000.

Short thatching spars are about per 1,000.

Try to discover the cost of spars per thousand in your district. Use this knowledge to find the cost of the spars needed by the farmer for thatching on the farm your School regularly visits.

Faggot Making. Whilst in the copse find the stack of faggots made by the woodman. Faggots are bundles of kindling wood (firewood). Count the faggots and calculate their value at the local price per 100.

Cutting Larch Stakes. Find the larch stakes which have been cut in the copse.

These are needed for fencing. Count them and find their value at a dozen.

If pointed and creosoted the price is per dozen.

Find the value of the pointed stakes in your copse.

Chestnut Fencing. This has become an important craft in some districts, owing to the popularity of this kind of fencing.

Find out how much chestnut fencing costs per yard. Then calculate the cost of the fencing needed to go round :

(*a*) your playground;
(*b*) your school garden;
(*c*) your playing field.

FINDING THE HEIGHT OF A TREE

THERE are several ways of doing this. Here are two.

(*a*) A fairly large isosceles triangle (90°, 45°, 45°) is cut out of plywood. When ready for use, it is held horizontally (test with a spirit level). The tree top, the hypotenuse of the triangle and the eye of the observer must be in as perfect alignment as possible. It is a good plan for the child to walk backwards from the tree, until this alignment is made. When made, the distance of the child from the tree plus the height of the triangle above the ground equals the height of the tree.

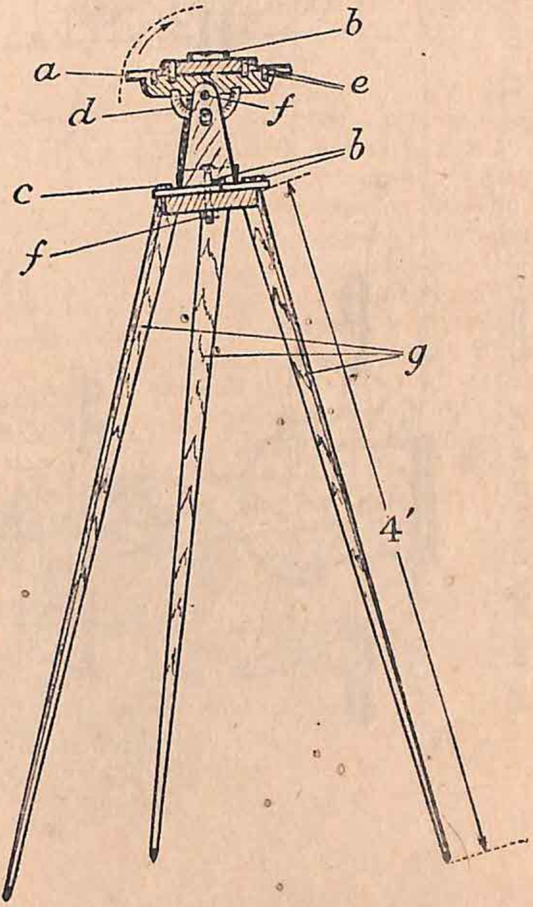


Fig. 13. SCHOOL THEODOLITE.
(Made by boys of 13 years of age.)

a—Brass Tube, corked (with pin-hole) one end, cross-wires at opposite end.
b—"Pocket" Spirit Levels.
c—Compass.
d—Brass Protractor.
e—Zinc Clips.
f—"Swivel" Bolts.
g—Tripod.

Fig. 14. SIDE ELEVATION OF THEODOLITE.

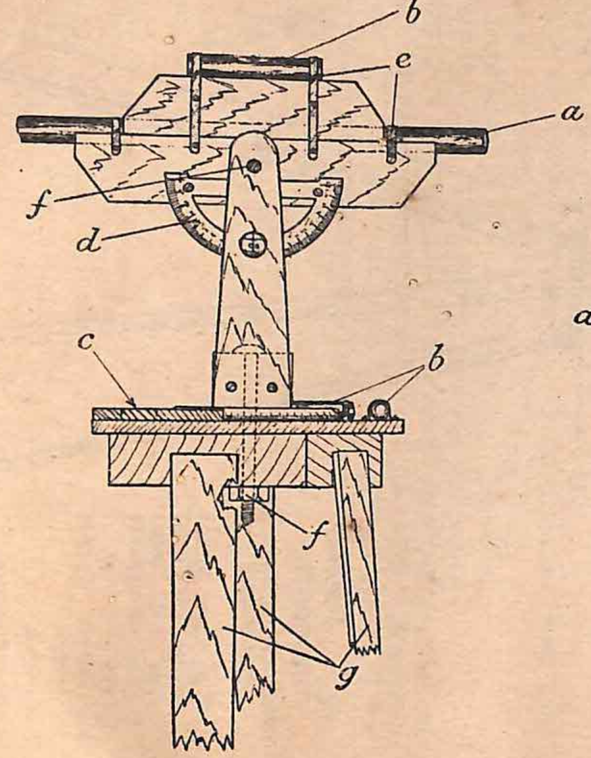
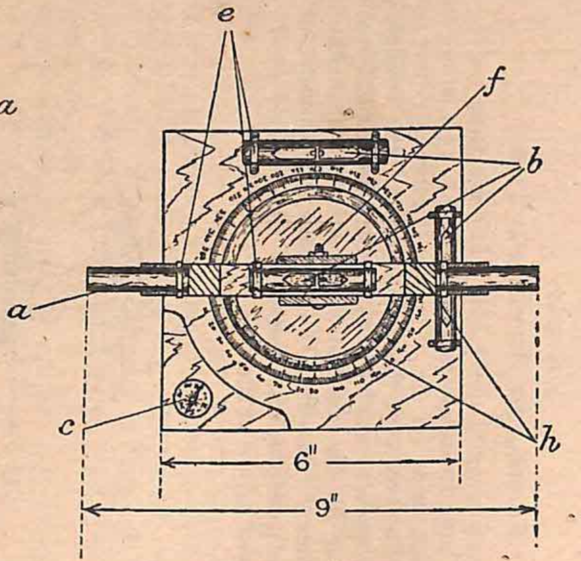


Fig. 15. PLAN OF THEODOLITE.



a—Brass Tube, corked (with pin-hole) one end, cross-wires at opposite end.
b—"Pocket" Spirit Levels.
c—Compass.
d—Brass Protractor.
e—Zinc Clips.
f—"Swivel" Bolts.
g—Tripod.
h—2 Brass Protractors.

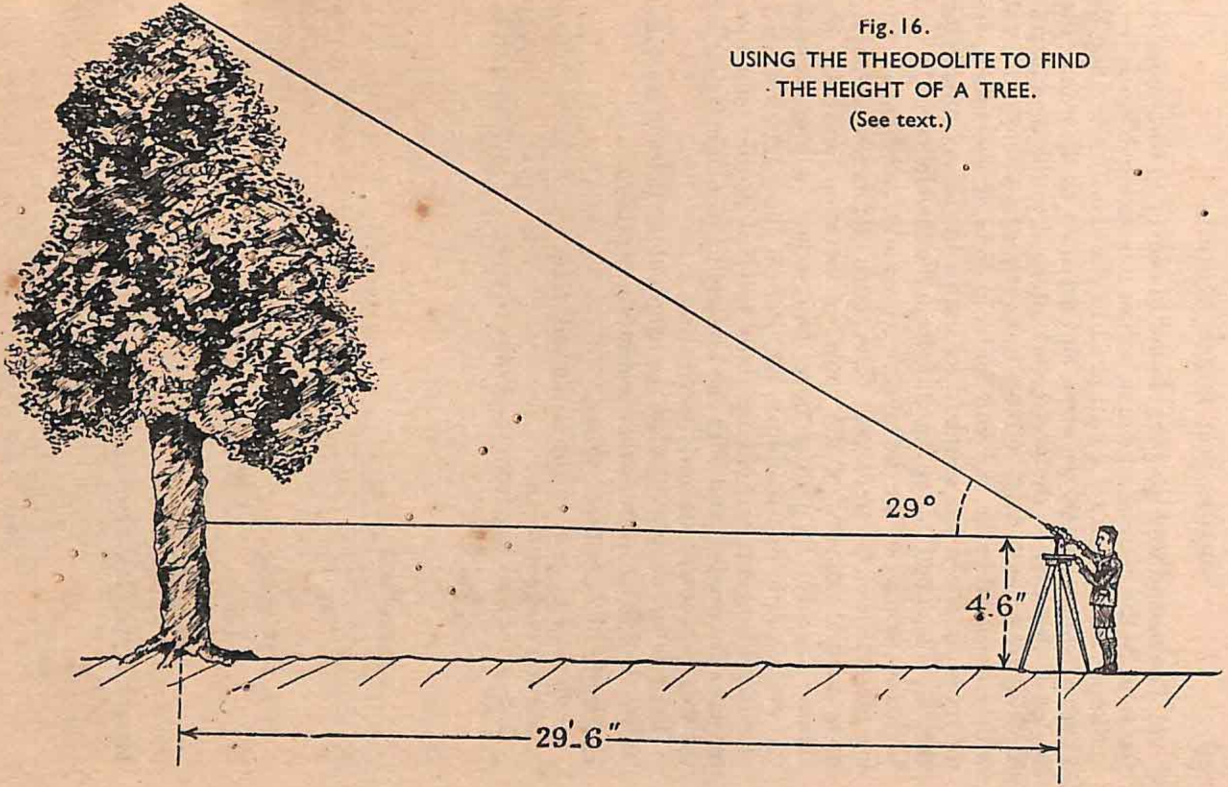


Fig. 16.

USING THE THEODOLITE TO FIND THE HEIGHT OF A TREE.
(See text.)

(*b*) The second way has been found to convey to rural scholars the value of the decimal system in a most interesting manner.

Simple theodolites are constructed in the school workshop at a cost of approximately 4s. each, and are used to determine the angles of elevation on the protractors attached to the theodolites. Sighting tubes, each made of brass tubing, 9 inches long and fitted with crossed wires at one end and pin hole at the other, are mounted on a wooden standard as shown in the accompanying sketch. The length of the base line from the theodolite to the tree is readily ascertained on the tape measure and is used in calculating the height of the trees, etc. The actual calculation is done by using natural tangents of the angles of elevation, and here the children discover, as perhaps never before, how helpful decimals can be. A little explanation is required to show how the table of natural tangents is built up (only integral degrees and their tangents are needed) and once the underlying principle is grasped the work becomes extremely fascinating.

The scholars should calculate the length of the boles of trees and utilize these lengths in timber measuring exercises.

Example of Scholars' Work.

Angle of elevation to top of an oak tree ...	29°
Natural tangent for 29°	·5543·
Length of base line from theodolite to tree... ...	29 ft. 6 in.

·5543 by 29.5
29.5

1108600
498870
27715

16.35185
4.5 = height of theodolite.

20.85185 feet.

Height of the Oak Tree = approximately 21 feet.

MEASURING TIMBER IN THE WOODS

Instructions to Pupils. Read the following directions relating to the method commonly used by wood merchants and woodmen when determining the cubic capacity of a tree. Study the example " worked out " and then go to the woods and calculate how much timber there is in one or two of the trees there.

First, ascertain the height of the trees up to the end of the bole (sometimes known as a " stop "). This occurs at the point where a sudden break in the trunk's uniformity of size takes place. It is customary to use a pole, 14 feet long, painted in black and white alternate feet, for this purpose. It is held against the trunk 6 feet from the ground, hence a length of 20 feet is clearly marked off. Any length beyond the top of the bole is judged by the eye.

The girth of the tree is next measured half-way between the base and the " stop." This is not always practicable, so the girth is often measured at a height of 6 feet from the ground and this measurement regarded as the " mean girth." A deduction from this figure is allowed for waste wood as represented by the bark. For thick bark a deduction of one inch to the foot, for thin bark a half inch to the foot is made. A quarter of the nett girth is then calculated.

The cubical content of the tree is found by squaring the nett quarter girth and multiplying by the length of the bole.

(N.B.—The limbs of the tree, unless of good size, are disregarded.)

Example.—To calculate the amount of timber in an ash tree.

Mean girth = 6 ft. 3 in. (deduct ½ in. to the foot for the thin bark of an ash tree,

deduct for bark 3 in.

4)6 ft. 0 in.

1 ft. 6 in.—square this measurement and multiply by length of tree (28 ft.)

$= \frac{3}{2} \times \frac{3}{2} \times \frac{28}{1} = \frac{3}{1} \times \frac{3}{1} \times \frac{7}{1} =$ 63 *cubic feet of timber in the ash tree.*

For conversion of the 63 cubic feet of ash into sawn timber, 40 per cent. should be allowed for wastage. This per cent. deduction is usually made in the timber trade.

VISIT the coppice in which the hurdle maker is working. Watch his method of fashioning the wattle hurdles.

1. Measure the length of each split hazel rod he has prepared for weaving between the " shores " and the " sails." Calculate the length of all the cleft rods needed to make a hurdle of the usual size (6 ft. by 3 ft.)

2. Ascertain how many hurdles the hurdle-maker makes in a day or in a week, and try to discover how many he makes in a year. (N.B.—Hurdle making is not carried on continuously throughout the year.)

3. What is the hurdle-maker paid for his hurdles at local rate of payment ? On the average, what are his weekly earnings ?

4. Use the price list, given later in this book, to calculate the price a wholesale merchant would charge for the hurdles the hurdle maker makes in a year.

5. Ascertain the number of hurdles used on local farms and calculate their cost.

6. Try to discover if the demand for wattle hurdles is increasing or decreasing.

7. Try to discover if the slat hurdles are preferred to wattle hurdles and if so, why ?

8. What would it cost to replace the slat hurdles by wattle hurdles on the farm you visit ? (See Price List on page 63.)

9. What would it cost to replace the wattle hurdles by slat hurdles ?

10. Ascertain the weight of a hurdle and find out how many would make a waggon load of a ton.

Exercises.

1. How many hurdles does the shepherd use to make the sheep fold you visit ?

2. What is the area enclosed by these hurdles ?

3. What would be the greatest area of ground it would be possible to enclose by using these hurdles to form a sheep-fold the usual quadrilateral shape ?

4. Determine cost of hurdles at current prices. (See price list given in this book.)

Fill in the blank spaces to answer the following questions :

5. At the sheep fold—hay cages are in use. Find the length of each cage. What would be their cost at (see price list).

6. The ewes in the fold are given hay daily. In addition they are given a quantity of mixed corn every day. This is fed at the rate of of corn per day per ewe. Count the number of sheep in the fold and calculate the amount of corn used in a month (answer in tons and cwts). What was the cost of the corn at per ton ?

7. Besides hay and corn, water has to be hauled to the fold every day from the farm in the horse-drawn water-barrel. The water-barrel is cylindrical in shape with a diameter of and a length of .

How many gallons of water does the barrel hold ?

WORK IN THE SMITHY

THE children should visit the smithy and obtain the necessary figures to fill in the blank spaces in the following "sums." Work out your answers by *short* methods of calculation. Set out your results in your note-books at School.

1. It took a certain boy   minutes to drill a screw hole in an angle plate at the smithy. In addition it took him   minutes to countersink each hole. Each angle plate had   holes. How long, at that rate, would it take him to drill and countersink the screw holes in half a dozen similar angle plates ?

2. Each " S " link needs   inches of ¼ in. rod iron.
Each " shut " link needs   inches of ¼ in. rod iron.
How many " S " links could be made from a rod a dozen feet long ?
How many " shut " links could be made from another rod of similar length ?

3. A strap bolt had   threads to the inch. How many threads to the foot ?
Measure the dimensions of the flat portion of a strap bolt. Calculate how much iron is in this portion.

4. If a smith uses   lb. of " breeze " coal each working day, how long will half a ton last him ?

5. A clinching staple made of rod iron was   inches long at the start. When forged, " drawn down " and the ends flattened out it measured   . What per cent. increase in length was this ?

6. Measure the diameter of the waggon or cart wheels sent to the smithy to be re-tyred. Calculate the length of iron the smith would need to re-tyre each.

SHOEING AT THE SMITHY

THE children should visit a smithy, and watch the blacksmith shoe a horse or pony before attempting to answer these questions. They should obtain all the necessary data themselves.

1. To shoe "Duke" with a new set of shoes costs . This he requires every four weeks. Find yearly cost.

2. Use this knowledge to discover yearly cost of maintaining a farm horse. There will be (*a*) feeding expenses, (*b*) saddler's expenses, (*c*) blacksmith's expenses. (Omit the wages of the carter.)

3. From some farming accounts of 1883 it is found that to shoe a horse with new shoes cost then 2s. 4d. How much less would the yearly cost have been to shoe "Duke" had he lived in 1883?

4. To remove the four shoes, pare and trim the hoofs, make good and refit the removed shoes (or renew when necessary) costs . A horse named "Blackie" requires this attention every fortnight; find yearly cost.

5. A hackney pony often requires his hoofs to be fitted with the correct weight of shoes. A pony named "Merrylegs" needs shoes weighing each, and these have to be fitted every fortnight during May, June, July and August (the Show period). Find total cost at a visit to the blacksmith's. What is the total weight of the shoes used in this period?

BUYING AND SELLING THE ARTICLES MADE BY RURAL CRAFTSMEN

EXCELLENT arithmethical training can be obtained from a simple price list, particularly if the list has close relationship to the practical work of the scholars. The list on page 64 shows the current prices of things made by rural craftsmen. The prices have a very real meaning to the pupils, as they themselves make similar articles to those listed, and often enquire the commercial value of the things made in the school workshop.

Children are frequently puzzled to find so great a margin between the prices paid to the craftsmen and the "shop price." It seems well, therefore, to tell the children a little about trading both from the wholesale and the retail points of view. In order to show that among the factors which influence the retail price, the cost of transport is of no mean importance, steps have been taken to ascertain the prices of such articles at their place of manufacture and their cost on rail. The prices quoted relate to the prevailing figures in Wiltshire and Dorsetshire, and the stations mentioned are Salisbury, Downton and Blandford.

The children should co-operate with the teacher in building up a price list with the correct figures obtaining in their own district. When completed, each child should have a copy of the full list. The list given is supplied to show the teacher the type of price list suggested. It is not intended for the use of the pupils who should be expected to work with the teacher in compiling their own.

The following are types of questions which have been found useful:

1. Use the price list to determine the cost of the following *at the place where they were made* :
    5 doz. hay rakes.
    2½ doz. sneads for scythe handles.
    8½ doz. Sheep cribs (7 ft. each).
    2 doz. lambing coop cribs (1 ft. 9 in.) each.
    5 doz. drag rakes.
2. What would be the cost of the above on rail at Salisbury Station? Find the difference in the two amounts.
3. Find the cost on rail at Downton Station of 2½ gross of besoms.
4. Find the cost on rail at Blandford Station of the following :—
    4 doz. hurdles (Wattle type).
    3 doz. Gate hurdles.
    20 doz. hurdle stakes.

50 larch poles for rustic work each.
500 faggots.
100 bundles of beansticks.
100 bundles of peasticks.

5. Find the price of above if fetched by motor from the place of manufacture.
What is the difference in cost ?

6. Find the price of following at the place of manufacture :
2 doz. drag rakes.
6 doz. hoe handles 3 ft. 6 in. each.
4 doz. hoe handles 4 ft. each.
3 tons of sawing wood.
3,000 wall spars (20 in.).
4,500 long spars (40 in.).
(Allow 5 per cent discount for cash.)

7. Find price of the above if placed on rail at Salisbury Station. Allow 2½ per cent. for cash.

ARTICLES MADE BY RURAL CRAFTSMEN

ARTICLE	Price at place of manufacture	Price on Rail.	Station.
Hay Rakes (price per doz.) 15 teeth ..			
Withy ..	13 0	13 6	S.
Ash Heads ..	15 0	15 6	S.
Drag Rakes (price per dozen)	55 0	57 0	S.
Hoe Handles ,, ,, ,, 3 ft. 6 in. ..	3 5	3 6	S.
Do. ,, ,, ,, 4 ft. ..	4 2	4 4	S.
Sheep Cribs ,, ,, 7 ft. ..	42 0	44 0	S.
Lambing Ewes' Cribs (price per doz.) 1 ft. 9 in.	17 6	18 0	S.
Faggots per 100	20 0	30 0	B.
Oak Gate Posts (price per pair)	15 0	17 6	B.
Cord or splitting or sawing wood (per ton)..	11 6	14 0	B.
Wattle Hurdles (6 ft. by 3 ft.) (per dozen) ..	22 6	25 0	B.
Cleft Gate Hurdles ,, ..	32 0	33 6	S.
Hurdle Stakes ,, ..	1 9	2 0	B.
Bows for Hay Cribs (per 100)..	11 0	11 6	S.
Larch Poles (for Rustic work) 1s. to 2s. 6d. per	pole.		B.
Scythe Sneads (fitted complete) (per doz.) ..	38 6	39 6	S.
Scythe Nibs (per 100)..	17 0	17 0	S.
Woods nibs ,, ,, ...	24 6	24 6	S.
Yard Spars (36 in.) (per 1,000)	13 0	14 0	S.
Long Spars (40 in.) do.	16 0	17 0	S.
Long Spars (48 in.) do.	20 0	21 0	S.
Wall Spars (about 20 in.) (per 1,000) ..	10 0	10 6	S.
Beetles (applewood heads)	8 0	8 6	S.
Beansticks (per bundle)	1 0	1 2	B.
Peasticks ,, ...	6d.	8d.	B.
Spar-gads ,, ...	8d.	11d.	B.
Besoms (per doz. in gross lots)		6 6	D.
Besoms (per doz. in small lots)		8 0	D.

S—Salisbury Station.
B—Blandford Station.
D—Downton Station.

APPENDIX

ARITHMETICAL DATA FOR THE INFORMATION OF TEACHERS

The cost of " laying " hedges is at the rate of 1s. 6d. a perch (approximately).

The cost of " trimming " hedges is at the rate of 4d. a perch (approximately).

The cost of cleaning and digging out ditches is about 1s. to 1s. 6d. a chain.

A " lug " of ground is 30¼ square yards, i.e., a square pole.

A two-horse plough turns about an acre a day (8-hour day).

A tractor plough turns about 3 to 6 acres a day (8-hour day).

The width of a furrow is about 9 in. wide (varies considerably).

The depth of a furrow varies from 3 in. to 6 in.

Long thatching spars are about 15s. per 1,000.

Short thatching spars are about 10s. per 1,000.

Bundles of thatching spars usually contain 250 each and if twisted, usually 100 make a bundle.

Faggots of kindling wood are about 20s to 30s. a 100.

Larch stakes are about 6s. a dozen.

The usual size of a wattle hurdle in 6 ft. by 3 ft. (each having 4 " shores " and 6 " sails ").

The usual length of a sheep-fold hay cage is 7 ft.

Hurdle makers often make 8 to 10 hurdles daily.

They are paid 9 or 10 shillings a dozen for making them.

9 to 14 cubic yards of hay weigh a ton.

16 to 21 cubic yards of straw weigh a ton.

A rick—30 ft. long by 15 ft. wide—needs roughly 100 bundles of thatching straw to thatch it.

Each bundle of thatching straw costs about 1s.

To lease 100 bundles of thatching straw costs about 12s. (men's rate of labour).

Women are frequently paid 1d. a bundle for leasing.

A new set of shoes for a farm horse costs about 7s.

A hackney pony requires his hoofs to be fitted with shoes weighing about 1 lb.

Refitting shoes, paring hoofs, etc., about 4s. each horse.

1 cubic foot of water = 6¼ gallons (approximately).
1 gallon water = 10 lbs.
1 gallon of milk = 10.2 lbs. (approximately).

Method of determining weight of hay rick :—

Measure the length and breadth of the rick half-way up to the eaves.

Measure the two lengths and take the average length.
Measure the two breadths and take the average breadth.
Take the height from ground to eaves *perpendicularly*.
Take $\frac{1}{3}$ of the perpendicular height from eave to ridge.

e.g.
Content of body of rick = 20 ft. by 15 ft. by 10 ft. = 3000 cubic feet.
Content of roof of rick = 22 ft. by 16 ft. by 2 ft. = 704 " "
27)3704 " "
137 + cubic yds.
10 cubic yds. of hay = approx. 1 ton, ∴ 137 cu. yds. = $13\frac{7}{10}$ tons.
∴ 13 *tons* 14 *cwts* of hay in the rick.

N.B.—This may vary from 9-14 cubic yards to the ton according to the degree of compactness of the hay in the stack.

TABLE OF NATURAL TANGENTS

Arranged for the use of children in the Exercises in Forestry (see page 56).

°	Tangent	°	Tangent	°	Tangent
1°	·0175	31°	·6009	61°	1·804
2°	·0349	32°	·6249	62°	1·881
3°	·0524	33°	·6494	63°	1·963
4°	·0699	34°	·6745	64°	2·050
5°	·0875	35°	·7002	65°	2·145
6°	·1051	36°	·7265	66°	2·246
7°	·1228	37°	·7536	67°	2·356
8°	·1405	38°	·7813	68°	2·475
9°	·1584	39°	·8098	69°	2·605
10°	·1763	40°	·8391	70°	2·747
11°	·1944	41°	·8693	71°	2·904
12°	·2126	42°	·9004	72°	3·078
13°	·2309	43°	·9425	73°	3·271
14°	·2493	44°	·9657	74°	3·487
15°	·2679	45°	1·0000	75°	3·732
16°	·2867	46°	1·0355	76°	4·011
17°	·3057	47°	1·0724	77°	4·331
18°	·3249	48°	1·1106	78°	4·705
19°	·3443	49°	1·1504	79°	5·145
20°	·3640	50°	1·1918	80°	5·671
21°	·3839	51°	1·2349	81°	6·314
22°	·4040	52°	1·2799	82°	7·115
23°	·4245	53°	1·3270	83°	8·144
24°	·4452	54°	1·3764	84°	9·514
25°	·4663	55°	1·4281	85°	11·43
26°	·4877	56°	1·4826	86°	14·30
27°	·5095	57°	1·5399	87°	19·08
28°	·5317	58°	1·6003	88°	28·64
29°	·5543	59°	1·6643	89°	57·29
30°	·5774	60°	1·732		

GLOSSARY OF TERMS

Arable Land	Ploughland, land which is ploughed fairly regularly.
Bavins	Bundles of slender sprays of wood cut and tied in the copse by the woodman when clearing the underwood. (Often entirely of silver birch.)
Beetles or " Bitels "	Wooden mallets used to drive iron wedges when splitting timber, or driving stakes into the ground when fencing. They are made of seasoned apple wood and ash handles.
Binders	Long rods of small diameter used to interlace between the upright stakes, in " stake and heather " fencing. The rods are sometimes made of bramble briars, willow, or hazel.
" Breeze "	The special coal used by the smith on the forge fire.
" Chestnut "	A corky protuberance often found on the inside of the legs of horses. Sometimes known as " cawkin."
Cleft-Wood	Wood split apart by a splitting tool, i.e., spar-hook, splitting knife, etc.
Clinker	The cinder of slag or a vitreous mass formed in the smith's fire.
" Dag " Nails or " Spikes "	The smith's nails used to fix the iron rings on the bitel.
Drag Rakes	The large wooden rakes about 5 feet in length used in the hay-field. They are dragged forward to collect the hay.
Draw knife	A knife used by woodworkers to pare off shavings of wood when fashioning it to shape. The usual draw knives are straight edged. The curved ones used by the rural craftsmen are made at a local smithy.
" F " Wrench	A useful tool, shaped like the capital letter " F " used by the smith for twisting iron.
Faggots	Bundles of wood, cut and tied by woodman in the copse when clearing the underwood. Sold as kindling wood.
Fluxes	Sand, borax, sal ammoniac, etc., used by the smith to prevent iron oxidizing—" scaling "—when welding piece to piece.

Girth	A quarter of the circumference of a tree.
Green timber	Timber not yet dry, but still containing sap.
Hames	Steel or brass fittings on the horse's collar, to which the shafts are hooked or fastened.
Helm	One of the five small bundles in the large "bundle" of thatching straw.
Hoppers (dry mash)	Containers for the mash to be fed to animals. The hoppers referred to in the text are for use in folding units for poultry. They are fitted with rollers to prevent the birds perching on them.
Hurdles	*Wattle hurdles*—often 6 ft. by 4 ft. or 6 ft. by 3 ft. A fence made of split hazel, or other suitable wood, used by the shepherd to enclose his flock on arable land or on the downs. *Slat or Bar hurdles*—usually or 6 or 7 cross-bars fitted through end "shores" (uprights).
Lambing Coop	The small enclosure made of hurdles, which are bedded with straw. Ewes about to lamb are confined in coops until they and their offspring are fit to rejoin the flock.
Leasing	Arranging rick straw into bundles of thatching straw.
Lug	A square rod, pole, or perch (30¼ square yards).
Piping	When metal is drawn down on the anvil to a round point, there is a danger of piping, i.e., forming a hollow point. This is due to the outside layers of the metal being stretched more than the inner ones. To avoid piping, the metal should first be drawn down to a square end and then rounded off to a point on the anvil face.
Quilley Hole	The small aperture in the body of the wattle hurdle, about two-thirds from base, used by the shepherd when carrying hurdles.
Rample Irons	Iron fittings on the post to which a cow is chained when in the cow byre (or cow "skillings"). See sketch on page 23.
Run	To split easily.

" Sails "	The six intervening uprights in the wattle hurdle.
Scythe Sneads	The curved " handles " affixed to scythe blades.
Shackles	D-shackles or double D-shackles. Iron links forged by the smith for linking together the parts of the whipple trees weighbeam—essential parts of the traces for draught horses when attached to ploughs, mowing machines or sets of harrows.
Sheep Cages	Hay containers for use in the sheepfold.
" Shores "	The two uprights at each end of the wattle hurdle.
Shoulder	The projection on each of the drag rake's teeth preventing them from being driven further into the rake head.
Shrouding	This term denotes the trimming of the living boles of trees of all encumbrances and surplus side branches so that the main trunk is clean and devoid of a multiplicity of minor side growths.
Shut Link	An iron link which can be " shut " or fastened after linking together two portions of a chain. Carters often carry one or two to effect repairs to trace or tug.
" Shutting "	The blacksmith's term for welding.
Silage	Conservation of surplus green fodder on the farm.
Silo	The container in which silage is made.
Snead " nibs "	The small wooden " grips "—two on each snead held by the mower when scything.
Spars	Split hazel rods, pointed at ends, used in thatching. They are of varying lengths, i.e., long spars about 4 ft., yard spars 36 in., wall spars 18 in. to 24 in. (They are called " spekes " in some districts.)
Spar Hook	Small, slender handled hook, curved at top, used to split wood, e.g., spars, or trim off the trimmings in the hedgerow, etc.
Spicks	Spars used in thatching.
Spikes	" Dag " nails used by the blacksmith to fix bitel rings.
Splitting Knife.	Or " throe "—a common name in some rural areas—a knife with a wooden

	handle 10 in. to 12 in. long, used to split wood held in the splitting vice.
" Stone-walling "	Dry-stone wall building.
" Stop "	The upper end of the main bole of a tree. It occurs at a point where a sudden break in the trunk's uniformity of size takes place.
Strap Axle	A short flat " strap " of iron which is worked down to the round at one end to take a wheel.
Strap bolt.	A flat iron strap, with one end worked down to round, threaded and fitted with a nut.
Thorn Stowls	The thick thorn boles common in hedgerows.
Thread	The thin spiral on bolt or screw.
Throe	A splitting knife used by rural craftsmen.
To Stowl out	To tiller.
True out of wind	Without winding or twist.
Upsetting Iron	The process of preparing iron for welding so that the welded juncture is the same size throughout, i.e., uniform in thickness with the parts welded.
Weigh-Beam	The long beam to which the wippenses are attached by iron shackles.
Whipple-trees	Part of the traces' gear needed when two or more horses are used to draw a single implement, e.g., plough, set of harrows, etc. In some areas the local term is " wippenses."
Worm	Thread on bolt or screw.
Wrought Iron	Malleable iron, capable of being fashioned to shape or welded in forge.
Yolming (Oxfordshire) or Yelming (Wiltshire)	Drawing out the wet straw for thatching.

TWO LIBRARY BOOKS ON RURAL CRAFTS

The Village Carpenter. Cambridge University Press. 8s. 6d.

The Wheelwright's Shop. Cambridge University Press. 2s. 6d.

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